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A SYSTEM OF GYNECOLOGY AND OBSTETRICS

BY AMERICAN AUTHORS.

EDITED BY

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revealed cancer of the stomach. Bean[1] made the same mistake in diagnosis in a case in which the post-mortem examination showed tuberculous meningitis as the probable cause of the vomiting. Horocks[2] has recently described a case of severe vomiting in pregnancy terminating in death after miscarriage. The necropsy revealed the liver extensively diseased by a primary encephaloid carcinoma, the parts not infiltrated by cancer being fatty. In commenting upon this case Horocks remarks: "It may be that the cancer of the liver had nothing to do with the severe vomiting in this case; but had there been no pregnancy I do not think any one would have thought there was anything strange in this symptom with such a lesion, whilst the vomiting itself was so severe as to be, at all events, very unusual from pregnancy alone."

PROGNOSIS.—Severe vomiting in pregnancy is always ground for anxiety, and the prognosis must always be guarded. When the symptom is due to pregnancy alone, in the entire absence of the aggravation of any previously existing condition, the outlook is favorable. It is doubtful whether an authentic fatal case of this kind is recorded. Such cases have never been seen by observers of the largest experience.

When the vomiting is due to the aggravation of a previously-existing lesion of the alimentary canal, the prognosis becomes more serious. Particularly is this statement true of gastric ulcer. Perforation not infrequently follows the violent efforts at retching and vomiting. Mention has already been made of the phlegmonous inflammation of the gastric parietes as a sequela of antecedent chronic catarrhal gastritis.

Cases of gloomiest prognosis are those in which the hyperemesis sustains no causal relation to pregnancy.

The prognosis with reference to the child, so far as it is influenced directly by the defective nutrition of the mother, is not unfavorable. Death of the fœtus from inanition and spontaneous abortion or premature labor, as before remarked, is a very exceptional occurrence.

TREATMENT.—The treatment of the pernicious vomiting of pregnancy depends largely upon the accurate recognition of the adjuvant and determining causes. An efficient rational therapeusis must consist in the elimination or modification of these etiological factors as far as the conditions of the concrete case will permit. The treatment naturally resolves itself into—(1) hygienic; (2) medical; (3) gynecological; (4) obstetrical.

Hygienic.—The hygienic treatment is of avail in the minor degrees of the disorder, although not without definite influence in the more serious cases. Diet is of primary importance. Let the patient breakfast upon a morsel of toast or cracker with a small cupful of strong coffee or tea, half a cupful of milk and lime-water, early in the morning, in bed in the horizontal position, and lie quietly for one or two hours after the meal. Small quantities of easily-digestible food—peptonized milk, egg-albumen in water, animal broths—at brief intervals will be tolerated when the patient has given up all pretence at keeping to regular meals. Koumiss, milk and soda-water, dry champagne, are frequently grateful beverages on account of the carbonic acid. Absolute dietetic rules, however, cannot be maintained. The stomach of the pregnant woman is proverbially capricious and fanciful. Charpentier narrates the history of a case suggestive in connection with this subject. The patient, four months advanced in pregnancy, in a critical condition from uncontrollable vomiting, came under the care of Beau in the Hôpital de la Charité. One day she asked for crawfish *à la bordelaise*. Beau granted her request, and at once ordered the crawfish from a neighboring café. On the first day two crawfish were retained; on the second, six; on the third, crawfish *ad libitum*, bouillon, and milk. "How often, indeed," remarks Cazeaux, "have I not seen women eat ham, pâté-de-foie-gras, and the like, who could not digest a piece of sole or the white meat of fowl!" It is necessary to respect these caprices and fancies.

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[1] Charpentier.

[2] *Loc. cit.*

When all food exhibited per os is rejected, absolute stomach-rest is indicated. Nutrient enemata may now be tried. Of the great value of rectal alimentation under these conditions there can be no doubt. Henry F. Campbell[1] relates the history of a case of pernicious vomiting of pregnancy in which he fed the patient by the rectum alone for fifty-two days. In commenting upon the value of this method Campbell remarks: "Under the careful and systematic application of rectal alimentation artificial abortion for the relief of gravid nausea can be banished from practice, even as a last resort." There is some danger, however, of irritating the mucosa of the intestine and causing diarrhœa—a peculiarly unfavorable complication at this time. This danger can be obviated commonly by attention to the quantity of fluid injected, the number of the enemata, and the chemical reaction of the foods. Of the various nutrient enemata, Leube's beef-and-pancreas mixture,[2] cream, defibrinated beef's blood,[3] peptonized milk, egg-albumen, beef-extracts containing soluble albuminoids, are among the best. From four to six ounces should be exhibited, not more frequently than once in six hours. The chemical reaction of the fluid employed should be of such a degree of alkalinity as to correspond with that of the succus entericus.

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[1] *Trans. Am. Gyn. Soc.*, vol. iii.

[2] Foster: *Clinical Medicine*, p. 24. The formula for Leube's beef-and-pancreas mixture is five to ten ounces of finely-chopped beef; one-third as much finely-minced pancreas (pig or ox). Treat this mixture in a mortar with five fluidounces of lukewarm water.

[3] The late Albert H. Smith suggests the addition of one grain and a half of chloral to the fluidounce to prevent decomposition.

Alexander Harkin[1] asserts that there is a hyperæsthetic spot over the fourth or fifth dorsal vertebra, or over both, as the normal condition of every person. By blistering these spots this observer claims to have cured certain cases of hyperemesis of pregnancy. The experience of Prince[2] has in part confirmed Harkin's observations. There is some evidence that hyperæsthetic areas exist in the œsophagus, and Bruenniche[3] has successfully treated the uncontrollable vomiting of pregnancy by the introduction of a tube part-way through the gullet, but not into the stomach. In one case milk, broths, and pulverized beef were thus introduced and retained within the stomach. As soon as the patient attempted to swallow, however, the vomiting recurred. Kohler, Maerc,[4] and De la Roche have successfully treated obstinate hysterical vomiting by spraying the pharynx with the muriate of cocaine, with and without the subsequent use of the œsophageal tube.

In the severer cases the patient should be confined to her bed in the horizontal position, the room darkened, and the highest possible degree of mental and physical rest maintained. The beneficial effect of rest in the horizontal position on sea-sickness is well known, and its influence is only slightly less marked in the disorder under discussion. Sexual intercourse must be forbidden.

Weir Mitchell's[5] methods of renewing the vitality of feeble people by entire rest, and feeding in connection with passive exercise, are of value in certain cases.

The obstinate constipation frequently observed in this condition demands attention before recourse to active therapeusis.

Medical.—There are few drugs in the Pharmacopœia which have not been vaunted as specifics by some and found utterly worthless by others. This fact justifies the belief, as remarked by Schroeder, that all remedies are unreliable, and that spontaneous cures frequently occur.

In the minor degrees of the disorder remedies which exert a local influence upon the mucous membrane of the stomach are of decided value. Subnitrate of bismuth, oxalate of cerium (Sir James Y. Simpson), soda mint (℞. Sodii bicarb., gr. iv; Ammon. carb., gr. $\frac{1}{4}$; Ol. menthæ pip., gr. $\frac{1}{8}$), magnesia usta, correct excessive acidity and are mechanical sedatives. Small doses of the tincture of nux vomica are useful in chronic catarrhal gastritis. The various local anæsthetics are of importance. Cocaine has been extolled by Weiss, Otto,[6] Manasseien,[6] and others. This drug may be exhibited in small doses—one-eighth to one-quarter grain—at short intervals until the physiological action is evident. Otto has used cocaine with benefit in the aggravated cases of sea-sickness of pregnant women. Aconite diminishes the sensibility of the afferent peripheral nerves or benumbs the sensory reflex centres. Belladonna, creasote, carbolic acid, and the volatile oils may also be included in this list of more or less efficient remedies. One drop of the wine of ipecacuanha in a teaspoonful of water, given every hour, occasionally yields excellent results.

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[1] *The Lancet*, 1884.

[2] *Bost. Med. and Surg. Journ.*, Ap. 15, 1886.

[3] *Hospital-Tidende*, 1885, No. 29.

[4] *The Lancet*, 1886.

[5] *Fat and Blood*, Philadelphia, 1885.

[6] *Berl. klin. Woch.*, 1815, Nos. 35 and 43.

Talma[1] ascribes the disorder to cerebral anæmia, and advises the use of nitro-glycerin, the drug being exhibited in alcoholic solution or in olive oil in capsules. One milligramme is administered daily in three doses.

Alcohol is of undoubted value in cases of centric emesis. It is quite possible that the great value of champagne in sea-sickness and in certain cases of the vomiting of pregnancy is due not so much to its local action as to its absorption.

Of all medical agents, however, chloral, the bromides, and the preparations of opium are by far the most reliable, especially when the diagnosis of the purely reflex nature of the vomiting is reasonably clear. Under these conditions it is well to resort at once to these drugs, without temporizing with the remedies already mentioned. Chloral and the bromides are best exhibited by the rectum. Doses of sufficient size, and repeated at such intervals as to depress—and maintain in this state—reflex activity, are indicated. Thirty grains of chloral and sixty of potassium bromide may be added to one of the nutrient enemata, and the dose repeated, according to the indications in the concrete case, from one to three times in the course of twenty-four hours. Hypodermatic injections of morphine and atropine or suppositories of the aqueous extract of opium will frequently allay the distressing symptom after the failure of other measures. In many cases the exhibition of opium is contraindicated by the very great secondary nausea, depression, or even excitement, which it causes. Potassium bromide, as pointed out by Da Costa, and atropine, measurably counteract this tendency.

Blisters, the ether spray, the Faradic current applied to the epigastrium, Chapman's ice-bag applied to the dorso-lumbar region, have been of avail in the minor degrees of hyperemesis.

Gynecological.—Under the gynecological treatment a number of important operative procedures are included. Commonly, a rational indication for their employment exists and can be made out; in many cases, however, their use is entirely empirical.

1. If bimanual exploration reveals any morbid uterine displacement capable of producing symptoms, an attempt at rectification must be

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[1] *Revue Medico-chirurgicale des Maladies des Femmes*, Feb., 1886.

made. However, it is necessary to bear in mind the facts that the normal position of the pregnant uterus is one of anteversion or even mobile anteflexion, and that a certain degree of retroversion and retroflexion[1] can exist without the production of symptoms. Efforts at replacement must be extremely gentle. Henry F. Campbell has repeatedly expressed his confidence in the method of postural pneumatic reduction in the genupectoral position. This mode of reduction in pregnancy, when the retroverted uterus is not fixed, with or without manipulation through the vagina or rectum, is of undoubtedly very great value, notwithstanding the strictures of Simpson and Hart to the contrary. When replacement has been effected, the organ is retained in position by the cotton-wool tampon, posture, or, in a limited number of cases, by a properly-fitting pessary. Graily Hewitt's well-known advocacy of anteversion and anteflexion pessaries in this condition has not met with general professional approval. It is not at all improbable that the alleged relief experienced after the application of these pessaries in the many cases reported by this observer was merely a coincidence.

2. Local treatment of the vaginal portion constitutes by far the most effective procedure under this heading. M. O. Jones of Chicago many years since suggested the local application of a 10 per cent. solution of argentic nitrate in cases in which some morbid state was present. General attention was attracted to this method by J. Marion Sims. At the present time the plan is employed universally, and Carl Braun regards its efficiency as considerably greater than that of any other single mode of treatment. As practised in Vienna, the woman is placed in the lithotomy position, and after a vaginal douche Braun's hard-rubber cylindrical speculum is introduced and the vaginal portion engaged within the field. A 10 per cent. solution of nitrate of silver is poured into the speculum until the vaginal portion is completely covered. The solution is allowed to remain ten to twenty minutes, when it is decanted. The indication for the use of this method has been generalized in Vienna, so that it is now employed in all cases of severe vomiting, irrespective of the condition of the vaginal portion, as a purely empirical resource. It is seldom necessary to make more than two or three applications. The weight of testimony in favor of this simple procedure collected from innumerable sources is so great as to make its employment absolutely obligatory before resort to more radical methods.

Bretonneau suggested the application of belladonna to the abdomen, in the belief that the vomiting was caused by rigidity of the uterus. Cazeaux smeared the vaginal portion and the vaginal vault with the soft extract. Success attended the efforts of both observers in some cases, while the remedy was without effect in others. Cazeaux recommends the introduction of a tampon covered with the extract of belladonna against the vaginal portion.

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[1] Braune's *Frozen Sections*, Tab. ii. B.

William Duncan[1] records three cases in which complete and rapid relief followed the local application of cocaine. A 15 per cent. solution was painted over the vaginal portion and vaginal vault, while an application was made to the cervical canal by means of a probe wrapped with cotton. The introduction of such an instrument within the cervical canal is obviously a hazardous experiment, even in the hands of an expert. Successful results with the local application of this drug have also been noted by other observers.

In the event of some morbid state of the vaginal portion apparent to the eye or examining finger, local treatment in accordance with established principles is eminently indicated.

Of the value of treatment under these conditions there can be no doubt. Jacob Price[2] commends this therapy in no equivocal terms when he says: "I know of no disease of equal gravity that so surely yields to established rules of treatment as this one does to treatment based upon the view of a congestive or inflammatory causation—viz. rest in bed, emollient, mildly-astringent vaginal injections, the tepid sitz-bath, and especially, in extreme cases, the topical application of Battey's or a similar sedative lotion to the uterine cervix. I am sure that no one who carefully and intelligently carries out this plan of treatment will fail to bring relief in the most obstinate case."

3. Copeman[3] of Norwich, desirous of inducing abortion in a case of the uncontrollable vomiting of pregnancy, pushed the index finger through the cervical canal to the membranes and attempted to puncture the amnion with a sound. Failing to accomplish his purpose, he went home for assistance, and returned at the expiration of two hours. To his surprise, the hyperemesis had suddenly ceased. Since 1875, when this observer first published the results of this experience, cases have rapidly multiplied in which this method has been successfully applied. W. Gill Wylie[4] has devised a steel dilator as a substitute for the index finger. When the os externum is at all patulous, the index finger is altogether the safest and most efficient instrument. The plan of dilatation of the os externum and cervix by the index finger is a purely empirical procedure, does not always secure the desired result, and frequently causes abortion or premature labor. Nevertheless, as the ultimate resort before the evacuation of the uterine contents it has important functions.

Obstetrical.—The artificial evacuation of the uterine contents, if effected before the development of the febrile stage, is commonly followed by immediate cessation of the vomiting. In the large majority of cases the disorder terminates in recovery or death prior to the period of fœtal viability, so that the indication for the induction of abortion, and not of premature labor, must be considered.

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[1] *The Lancet*, Oct. 15, 1887, p. 754.

[2] *Transactions of the Medical Society of the State of Pennsylvania*, for 1884, "Address in Obstetrics."

[3] *Brit. Med. Journ.*, 1875, 1879.

[4] *N. Y. Med. Record*, Dec. 6, 1884.

But the same end may be attained in almost every case by the judicious combination of the hygienic, medical, and gynecological methods of treatment which have just been mentioned.

When the vomiting is not due to pregnancy, of course the interruption of pregnancy can have no directly favorable influence upon the course of the disorder. The rule that no case of fatal vomiting in pregnancy can be regarded as due to pregnancy in the absence of an autopsy invalidates the statistics already mentioned, as well as those of Joulin.[1] This observer has collected 121 cases of alleged pernicious vomiting of pregnancy, of which 49, or 44 per cent., were fatal.

Observers of the largest general experience (C. Braun, Kiwisch, Hohl, Ahlfeld, Hausmann, Cohnstein, Cazeaux) have seldom or never been compelled to resort to this last expedient.

Carl Braun[2] voices a very general professional conviction upon this subject in the following words: "I myself have never observed a lethal issue in consequence of the uncontrollable vomiting of pregnancy. I lay the greatest weight upon the expectant management and more modern medicamentation, and am of the opinion that after a conscientious estimate of all considerations and contraindications, artificial abortion may be omitted, notwithstanding its permissibility from a scientific point of view when extreme danger to maternal life has been determined by several physicians."

When serious disease of the decidua exists an important objection to the induction of abortion is removed.

Ptyalism.—The excessive secretion of saliva in the absence of pernicious vomiting is a rare disorder of pregnancy. The symptom commonly makes its appearance early and disappears spontaneously between the third and fourth months, although in exceptional cases it persists throughout the term of gestation, and even for some weeks after labor. The disorder is probably a reflex neurosis, and frequently returns in successive pregnancies. The constant dribbling of the secretion from the buccal cavity is always annoying to the patient. When the quantity reaches several quarts per diem the patient's life may be seriously endangered from inanition. Important qualitative changes occur in the saliva. The water is largely increased, while the organic and inorganic substances are diminished. In a case observed by Schramm[3] the disturbances of nutrition were probably due to the alteration in the constitution of the saliva, which deprived it of all digestive activity, ptyalin being entirely absent. The buccal mucous membrane is red and tumid. The parotid and submaxillary glands are swollen and tender. The absence of fetor serves to distinguish the salivation incident to pregnancy from the ptyalism of mercurial poisoning.

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[1] Collected from Deblet, Fabre, Guéniot, and others.

[2] *Loc. cit.*, p. 842.

[3] *Berl. klin. Wochenschr.*, 1886, No. 49.

The disorder commonly opposes an obstinate resistance to all methods of treatment. A generous diet, the free exhibition of iron, and astringent mouth-washes mitigate in some degree the severity of the symptoms. Atropine[1] has been injected hypodermatically over the enlarged salivary glands, on account of its well-known effect on the chorda tympani, with varying degrees of success. Pilocarpine is of some value in certain cases. Iodide of potassium is in general contraindicated, on account of its effect in the causation of uterine contractions. In small doses, however, the remedy is often efficient. Bromide of potassium[2] is, of all remedies, probably the most reliable.

Gingivitis.—Inflammation of the gums, commonly observed in connection with salivation, sometimes occurs in its absence. According to Pinard the disorder is commonly seen in multiparæ rather than in primiparæ. In 75 women—43 multiparæ and 32 primiparæ—this disorder was observed thirty-one times among the former and fourteen times among the latter.

The changes in the blood incident to pregnancy seem to play the chief rôle in the predisposition to this affection. The disorder is characterized by redness, swelling, and retraction of the gums, which are tender and bleed on pressure. The teeth are often loosened in their sockets and their necks exposed to the altered secretions of the buccal cavity, which are often acid. Mastication is frequently difficult and painful.

Extreme attention to the hygiene of the teeth is indicated. It is a good plan to rub precipitated chalk into the crevices between the teeth at night before going to bed, and to allow the protective to remain. Astringent alkaline dentifrices palliate the symptoms. Drugs exhibited per os, apart from the chalybeate tonics, exercise but little influence on the course of the affection, which usually persists through the term of pregnancy, and sometimes through lactation.

Constipation.—Constipation is a common, sometimes a troublesome, attendant upon gestation. In the majority of cases the habit is formed long before the occurrence of pregnancy. During gestation the chief etiological factors are the defective innervation of the intestines, alterations in the intestinal secretions, and the changes in the anterior abdominal wall, which interfere especially during the second half of pregnancy with its functional activity in the act of defecation. The direct mechanical pressure of the gravid uterus upon the intestinal mass is practically

[1] Ebstein: *Berl. klin. Wochenschr.*, 1873, No. 25.

[2] Schramm: *loc. cit.*

nil, as demonstrated by the plane frozen sections already mentioned. Constipation is of considerable prognostic moment, since it predisposes to hemorrhoids, and during the latter months, since the colon is distended with scybalous masses, it may act as an exciting cause of abortion or premature labor. Attention has already been directed to the hygienic treatment of this state. In the selection of aperient remedies care must be taken to choose laxatives and avoid drastic cathartics. The compound licorice powder and confection of senna of the U. S. Pharmacopœia, Hunyadi, Friederichshalle, and Pullna mineral waters, may be included in the list. Thomas recommends a modified confection of senna, which yields excellent results. The formula is—figs, 1 pound; senna, 2 ounces; coriander-seed, 1 ounce; sugar, enough to make a paste.

Diarrhœa.—Diarrhœa is a less frequent but more serious complication of pregnancy than constipation. In the early and latter months the disorder is liable to occur from mechanical compression of the rectum by the gravid uterus. Dysentery with tormina and tenesmus is a peculiarly unfavorable complication. The dangers are apparent. Not only is the blood impoverished, but also there is grave danger of the induction of abortion or premature labor. Accordingly, every diarrhœa occurring during pregnancy demands immediate attention.

Icterus.—Icterus is observed with relative infrequency during pregnancy.[1] Two distinct types, simple and malignant jaundice, are capable of recognition.

Simple Jaundice.—Simple icterus may occur at any time during gestation. At times it runs its usual course without untoward effect upon the maternal health. In very many cases, however, pregnancy[2] is the adequate cause of the transformation of a simple catarrhal icterus into the malignant jaundice symptomatic of acute yellow atrophy of the liver. Spiegelberg[3] attributes the unfavorable influence of pregnancy upon simple icterus to the following conditions: 1. The venous congestion and other circulatory disturbances in the kidneys incident to pregnancy, which limit the compensatory excretion of the bile salts. Traube and others have shown that the retention within the blood of the bile acids is capable of causing acute yellow atrophy of the liver. 2. The alterations in the blood caused by pregnancy, which diminish the physiological resistance of this fluid itself, as well as that of all the tissues. 3. The depression of cardiac energy by the accumulation of the bile acids in the blood, which still further diminishes the excretory functions of the kidneys.

The influence of icterus upon the course of pregnancy is equally unfavorable. The fœtus commonly dies early in the course of the disorder, and abortion or premature labor results. Out of 57 cases collected by Lomer, 45 fœtuses were stillborn. In these cases simple icterus was just as fatal to the product of conception as the malignant form of the disorder. The cause of fœtal death is due in the majority of cases, as pointed out by Davidson, to the bile acids which have been found in the fœtal blood. As a rule, the skin of the fœtus is not icteroid. Out of 62 cases collected by Lomer, the fœtuses were icteroid in only 6, although the liquor amnii was stained with the biliary coloring matters in all. As pointed out by Lomer, it is highly probable that this fact is due to the difficulty in passing the placenta experienced by all slightly soluble substances.

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[1] Carl Braun observed 18 cases in 28,000 pregnant women (1857–63).

[2] Lomer: "Ueber die Bedeutung des Icterus gravidarum für Mutter und Kind," *Zeitschr. f. Geb. u. Gyn.*, Bd. xiii. p. 173.

[3] *Loc. cit.*, p. 246; Davidson: *Mon. f. Geburts.*, Bd. xxx. H. 6, p. 465.

If the icterus is intense and has persisted for a considerable period of time, the skin and all the tissues are apt to be tinged with the bile-pigments—a condition termed cirrhonosis by Lobstein.[1]

The causes of simple jaundice in pregnancy are identical with those which produce the condition in the non-gravid state, and are frequently obscure. It is in a high degree probable that pressure from the gravid uterus is entirely inoperative, since the symptom may appear at any time during gestation. The morbid condition commonly present is a catarrhal inflammation of the mucous membrane of the common bile-duct or of the duodenum in the vicinity of the orifice, causing a narrowing of its lumen.

DIAGNOSIS.—The conjunctivæ, skin, and urine are colored bright yellow, and there is complete absence of febrile and cerebral symptoms.

PROGNOSIS.—The prognosis with reference to the mother must always be guarded, in view of the unfavorable influence exerted by pregnancy upon the course of the disease. In the present state of our knowledge it is impossible to make even a general statement as to the relative frequency of this occurrence. The outlook with reference to the child is always gloomy. In the few cases in which a living child has been born death has commonly resulted within the first days of the puerperium.

TREATMENT.—Active medical treatment, in accordance with the well-known principles, is strongly indicated just as soon as the icterus make its appearance. Excretion by the kidneys must be stimulated, and rendered compensatory as nearly as possible. The induction of premature labor in the interest of the mother is seldom indicated, inasmuch as the prompt institution of a rational therapy usually removes the morbid condition. When the icterus is intense and of long duration, this operation is frequently indicated in the interest of the child.

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[1] In Carl Braun's cases, already mentioned, the condition was probably due to hypertrophic hepatitis in one case, to disturbances in connection with the ductus choledochus in seventeen cases.

The force and frequency of the fœtal heart-beats demand attentive observation, and in the event of the appearance of signs of impending death pregnancy must be prematurely interrupted.

Malignant Jaundice.—Acute yellow atrophy of the liver is a rare complication of pregnancy. Carl Braun[1] observed the condition only once in 28,000 pregnant women (1857–63); Spaeth[2] saw the disorder only three times in 14,061 pregnant women. The rarity of the affection renders the view improbable that pregnancy exercises a very strongly predisposing influence. A large contingent of the cases recorded, however, is afforded by pregnant women. Out of 143 cases of acute yellow atrophy of the liver in which the diagnosis was verified by autopsy, Thierfelder[3] demonstrated the coexistence of pregnancy in 30. In 69 cases recorded by Legg, pregnancy was ascertained to exist in 25.[4]

Three principal views are held with reference to the nature of this disease:.

1. That it is the local expression of a general infection, especially aided in its development by the kidneys and nervous system. The agent of infection may be specific, the result of a typhous process or of puerperal sepsis.

2. That it is an essential primary disease of the liver, characterized by hyperæmia, exudation, and necrosis.

3. That it is due to the resorption of bile and to the solution of the hepatic cells by these matters retained in the blood. Thierfelder has shown that essentially different morbid states—cirrhosis, chronic fatty degeneration of the liver, compression of the bile-ducts by tumors, puerperal fever, relapsing fever, typhus, phosphorus-poisoning—having in common the single symptom of the stasis of the hepatic secretions and excretions, may under certain conditions terminate in acute yellow atrophy. Lomer suggests the plausible hypothesis that pregnancy supplies the necessary conditions for the dissolution of the blood-corpuscles and the hepatic cells by the retained bile acids.

MORBID ANATOMY.—The liver is ochre-colored, shrunken to one half its volume, and flaccid. On section no traces of its lobular structure are visible. Microscopical examination reveals total destruction of the acini and hepatic cells. In the place of the glandular elements, fat-globules, fine granular detritus, crystals of leucin and tyrosin, are noted. The spleen is enlarged and the kidneys show acute inflammatory changes. Extensive ecchymoses are observed in the meninges, under the skin, pericardium, and in the gastric mucous membrane. All the tissues are stained with bile. The blood shows profound disorganization, with the solution of the red corpuscles.

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[1] *Loc. cit.*, p. 848.

[2] *Wiener med. Wochenschr.*, 1854, p. 757.

[3] *Ziemssen's Handbuch*, 1878.

[4] Lomer: *loc. cit.*, p. 181.

SYMPTOMS.—"The prodromal symptoms," remarks Frerichs,[1] "are those of catarrhal gastro-enteritis," with the presence of a simple icterus which may last eight to fourteen days. A slight elevation of temperature may precede by several days the development of cerebral symptoms. Difficulty in speech, headache, disorders of the senses followed by delirium, convulsions—cholæmic eclampsia—and coma are the more important symptoms of cerebral origin. The pulse is remarkably small and frequent. The temperature is at first elevated several degrees, but becomes subnormal prior to death. The urine is sparingly secreted, highly colored by the bile-pigments, and contains albumen, tube-casts, leucin, and tyrosin. Urea, uric acid, and the urates are diminished. This combination of symptoms points to the retention within the blood of the waste products normally excreted by the liver and kidneys. Ultimately, a condition of complete hepatic and renal insufficiency is established.

DIAGNOSIS.—The dull yellow color of the skin, the fever, and the cerebral symptoms are signs of chief diagnostic import. Physical exploration reveals tenderness on pressure and rapidly-diminishing area of hepatic dulness on percussion. Acute phosphorus-poisoning, a toxæmia closely resembling acute yellow atrophy of the liver, must be excluded.

PROGNOSIS.—It is doubtful whether an authentic case of this disease has ever terminated in recovery. Examples of cure in supposed cases of acute yellow atrophy of the liver have been reported by Oppolzer, Lebert, and Harley. The accuracy of the diagnosis in these cases may well be questioned, since the very conception of the disease involves the idea of a fatal termination.

TREATMENT.—Therapeutic measures must be addressed to prophylaxis, since the course of the disease is rapid, commonly terminating within a few days. It is necessary to regard simple icterus as a possible prodrome of the malignant form of the disorder.

Diabetes.—The most superficial discussion of the disorders of pregnancy would be incomplete without brief mention of diabetes. Unfortunately, the observation of the clinical course of this affection during gestation has up to the present thrown but little light upon the pathology and treatment of the disease. Attention has already been called to the occurrence of physiological glycosuria during pregnancy, the puerperium, and lactation. Claude Bernard has shown that glucose appears in the placentæ of calves at an early period, attains its maximum in the third or fourth month, and entirely disappears when the glycogenic function of the fœtal liver is established. The relation between physiological glycosuria and that morbid exaggeration of a normal process, diabetes mellitus, is very obscure. It is, however, a clinical fact that diabetes mellitus occurs more frequently in the pregnant than in the non-gravid woman.

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[1] *Klinik der Leberkr.*, Bd. i. p. 206.

It is asserted that diabetic women are less apt to conceive. When conception does occur, pregnancy is liable to interruption from the death of the fœtus. In 7 of 19 pregnancies occurring in 14 women, collected by Matthews Duncan,[1] the fœtus died after reaching the age of viability. In 2 cases the child was feeble and died within a few hours of birth. In one case diabetes was observed in the infant. Hydramnion is of relatively frequent occurrence, and in one case the presence of glucose in the fluid was demonstrated. It is alleged that the fœtus is commonly of extraordinary size.

The influence of pregnancy in developing a latent diabetic tendency may be accepted as highly probable. Bennewitz records an interesting case in which the disorder appeared in the fourth, fifth, and sixth pregnancies, disappearing in the intervals. The fifth child was premature and stillborn.

In the fifteen women the history of whose cases is narrated by Duncan the age varied from twenty-one to thirty-eight years. With one exception they were multiparæ. Four cases terminated fatally after delivery: in one of these death occurred after the induction of premature labor. Death resulted from collapse rather than from coma.

The same observer[2] has recently reported certain cases of diabetes insipidus in pregnancy. One of them was congenital and persisted through eleven pregnancies. In another case four pregnancies occurred. Notable diminution in the amount of urea was observed.

In the fragmentary state of our knowledge with reference to the distinctive characteristics conferred upon diabetes by pregnancy it is impossible to formulate general statements as to prognosis.

There is great diversity of opinion upon the subject of the induction of premature labor. On *a-priori* grounds it would seem to be indicated in the interest both of the mother and of the child in the graver cases. In the entire absence of authoritative clinical experience, however, the operation must be resorted to with an extreme degree of caution.

DISEASES OF THE KIDNEYS.

Albuminuria.—Frequency.—Albumen, according to Schroeder,[3] is found in the urine of from 3 to 5 per cent. of all pregnant women, and is of still more frequent occurrence during labor. Ingerslev[4] discovered albuminuria in 29 out of 600 pregnant women, or in 4.8 per cent. of all cases. The albuminuria was of renal origin and of primary appearance during pregnancy in only 7 cases. It was referable to pre-existent Bright's disease in 1 case, and to catarrhal inflammation of the urinary ducts in 21. Flaischlein[1] examined the urine of 1000 pregnant women, and detected albuminuria in 26, or in 2.6 per cent. In 5 cases it was due to vesical catarrh, in 2 cases to antecedent chronic nephritis; in 3 cases the albuminuria was transient. Out of 200 cases in the Guy's Hospital Charity,[2] albuminuria was discovered in 4, and 2 of these were probably cases of chronic Bright's disease. Out of 422 cases in Bellevue Hospital,[3] albuminuria was found in 22. Other investigators have estimated the proportion of pregnant women whose urine contains albumen at 20, and even 30, per cent. The results of the researches of Ingerslev and Flaischlein are especially worthy of credence on account of the large number of cases and the accuracy of the methods of chemical analysis.

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[1] *Obstet. Trans.*, vol. xxiv.

[2] *Ibid.*, 1887.

[3] *Loc. cit.*, p. 373.

[4] *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. p. 176.

Mention has already been made of physiological albuminuria[4] as an occasional phenomenon under certain conditions in the course of pregnancy. The small quantity of albumen, the absence of tube-casts and renal epithelium, the transient character of the appearance, and the absence of all symptoms pointing to renal disturbance, are diagnostic criteria commonly sufficient to distinguish this phenomenon from albuminuria due to functional or organic disease of the kidneys. In the light of Ingerslev's and Flaischlein's observation the assertion by Behm[5] that pregnancy is invariably accompanied by albuminuria is plainly erroneous.

ETIOLOGY.—Pregnancy sustains with relative frequency a necessary relation to various forms of nephritis. A certain type of renal disease is observed only during gestation, and all the varieties of chronic Bright's disease are, as a rule, aggravated by the condition. The nature of this causal nexus, however, is still very obscure, notwithstanding the patient investigation of numerous observers from the days of Rayer[6] (1840) and Lever[7] (1842) up to the present. The subject is of vital importance, since the treatment of the condition itself and its chief symptom, eclampsia, depends almost exclusively upon the views entertained as to causation. Not one of the numerous theories which have been urged from time to time is in itself adequately explanatory of the renal complications incident to pregnancy. However, these theories are seldom contradictory propositions, and it is frequently the case that more than one etiological factor is in active operation.

1. The most ancient theory is that the albuminuria and kidney disorders are due to mechanical pressure of the renal blood-vessels, especially the veins, by the gravid uterus. Passive hyperæmia of the

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[1] *Zeitschr. f. Geb. u. Gyn.*, Bd. viii. p. 358.

[2] Galabin's *Midwifery*, p. 272.

[3] Elliott: *Obstet. Clinic*, N. S., 1868, p. 7.

[4] Leube: *Virchow's Archiv*, Bd. lxxii. p. 145.

[5] *Monatschr. f. Geb.*, Bd. xviii., Sup., p. 19.

[6] *Traité des Maladies des Reins.*

[7] *Guy's Hospital Reports*, 2d Series, 1842.

kidneys results, and this condition predisposes to, even when it does not actually excite, inflammatory changes. The chief representatives of this theory are Frerichs, Rosenstein, C. Braun, Litzmann, Cazeaux, and Möricke. Certain clinical facts lend probability to this view. Albuminuria commonly makes its appearance in the second half or during the latter months of gestation, at a time when the uterus is of sufficient size to exercise mechanical pressure. It is of relatively frequent occurrence in primiparæ who possess tense abdominal walls. In case of multiple pregnancy, hydramnion, and excessive uterine distension from other causes it is observed comparatively often. Litzmann[1] indeed goes so far as to assert that albuminuria is the rule in twin pregnancy, and that absence of this symptom establishes a strong presumption against the fact of multiple gestation. Albuminuria is frequently present in cases of large intra-abdominal[2] tumors, such as ovarian cystomata and uterine myomata.

Möricke[3] has called attention to the well-known fact that albuminuria is much more frequent during labor than during pregnancy at a time when intra-abdominal tension is greatest. This observer found pathological renal albuminuria ten times as frequent in labor as in pregnancy.

Albuminuria diminishes rapidly, as a rule, after labor. In many cases the apparent restitution to a strictly normal state occurs within twenty-four or forty-eight hours after the expulsion of the fœtus. This fact finds no analogue in the course of nephritis under other conditions.

The theory is no longer tenable that the venous stasis is caused by the pressure of the gravid womb upon the renal blood-vessels. Study of the topographical relations of the gravid womb shows that this viscus does not at any time actually compress these vessels. Moreover, Lahs' researches, already mentioned in detail, indicate that increased intra-abdominal pressure, and not pressure of the pregnant uterus, is the cause, *par excellence*, of the so-called mechanical disorders of pregnancy. Bamberger[4] in particular has called attention to this important modification of the pressure theory.

The view that venous stasis in the kidneys predisposes to, and under certain conditions actually excites, nephritis may be accepted as definitively established. Bamberger, from the investigation as to causation of 2430 cases of Bright's disease, estimates among the etiological factors valvular defects as accounting for 9.1 per cent. of the cases; pregnancy, 6 per cent.; pulmonary emphysema, 3.5 per cent.

The probability of the universal operation of this etiological factor, however, is very much lessened by the following considerations, which have been advanced by Bartels, Schroeder, Spiegelberg, Braxton Hicks, Robert Barnes, Ingerslev, Devilliers, Regnault, and others:

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[1] *Deutsche Klinik*, 1852.

[2] Bamberger: "Ueber Morbus Brightii," *Pester medecin-chirurg. Presse*, 1879, Nos. 24 and 25.

[3] *Zeitschr. f. Geb. u. Gyn.*, Bd. v. p. 5.

[4] *Loc. cit.*

Morbid renal albuminuria sometimes appears early in pregnancy,[1] before any considerable elevation of intra-abdominal tension. Ingerslev found renal albuminuria, due to pregnancy, only in one primipara; on the other hand, in five multiparæ. In the five cases of twin pregnancy and three cases of hydramnion, occurring in the 600 women examined, no albuminuria was present. In 67 cases of hydramnion collected by Levison albuminuria and anasarca were present in only 2.

Flaischlein[2] has examined the urine in 28 cases of intra-abdominal tumors, and detected albumen in only 3 cases, tube-casts in 2. In the 3 cases of albuminuria, ovarian cystomata, not of the largest size, were present.

Möricke's conclusion, that albuminuria is much more frequent in labor than in pregnancy, is not fully established by his own researches, inasmuch as a sufficient number of ante-partum urinary examinations were not made. Of 153 women during labor, Ingerslev detected albuminuria in 50. The development of the albuminuria, as already pointed out by Winckel, was favored by the long duration of labor. In 80.5 per cent. of the cases the albuminuria disappeared within forty-eight hours after parturition. Ingerslev suggests the idea that labor itself may be sufficient to determine nephritis and albuminuria. But in the cases cited by this observer adequate ante-partum examination of the urine was not carried out, and the conclusion is only an hypothesis. Out of the 1000 pregnant women whose urine was tested by Flaischlein, 537—295 primiparæ, 242 multiparæ—were observed during labor. Albuminuria was detected in 93 cases—73 primiparæ and 20 multiparæ—or in 25 per cent. of the primiparæ and in 8 per cent. of the multiparæ. Except in the cases of chronic nephritis and the kidney of pregnancy the albuminuria disappeared soon after labor. These observations render in a high degree probable the hypothesis that all affections of the kidneys characterized by albuminuria, hyaline and granular casts, and fatty degeneration of the renal epithelial elements may be caused by labor itself. In the causation of this albuminuria of labor it is not improbable that a reflex contraction of the renal arteries, and consequent renal anæmia, plays an important rôle. The polyuria after expulsion of the child and the cessation of uterine contractions is evidence of secondary relaxation of the renal arteries (Flaischlein).

The disappearance of albuminuria after labor, as pointed out by Bartels, only indicates that pregnancy is its cause. It does not prove that increased intra-abdominal tension is the exclusive, or even principal, factor. Moreover, as pointed out by Hofmeier,[1] Ingerslev, Flaischlein, and others, in many cases the renal albuminuria due to pregnancy assumes an extraordinarily protracted course, so that the prognosis quoad valitudinem completam, so far as the kidney of pregnancy is concerned, must be very reserved.

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[1] Robert Barnes: *The Lancet,* April 29, 1865.

[2] *Loc. cit.,* p. 389.

But these considerations, it will be noted, only impair the value of the pressure theory as an adequate explanation of all the renal disorders incident to pregnancy. Now, it is not claimed by the defenders of this view that venous stasis in the kidneys is the exclusive and universal etiological factor, but only one of the principal agents. To this proposition assent cannot fairly be withheld.

2. Halbertsma,[2] in particular, has called attention to the hindrance to the discharge of urine through the ureters by mechanical obstruction due to compression by the gravid womb or catarrh of the ducts themselves. Dilatation of the ureters, retrostasis of urine, changes in the renal parenchyma, and albuminuria ensue. Halbertsma confirms his theory by changes found in the kidneys and ureters in several post-mortem examinations, as well as by certain experiments. He found that if the ureters are compressed for a length of 8 cm. by a weight of 5 grams, the pressure of a column of urine 400 mm. in height is inadequate to overcome the obstruction. Aufrecht[3] observed albuminuria and fatty degeneration of the renal epithelium after ligation of the ureters. Out of 32 cases of fatal eclampsia recorded by Löhlein,[4] dilatation of one or both ureters was demonstrated in 8, or 25 per cent. This observer concludes that in 5 of these cases an already insufficient urinary excretion was still further limited, or even entirely interrupted, by urinary retrostasis in consequence of compression of the ureters, so that urinæmia and its symptom, eclampsia, were produced. Hiller[5] regards the possibility of the operation of this etiological factor as demonstrated. Kucher[6] in his admirable treatise suggests that it would be "more in accordance with all the facts to regard the enlarging or contracting uterus as capable of producing stretching, flexure, or infraction of the ureters." Halbertsma asserts that the reason why dilatation of the ureters is not found more frequently in the post-mortem examination of women dying of renal disease during pregnancy, labor, and the puerperium lies in the fact that the characteristic anatomical changes disappear rapidly after death. It is safe to regard obstruction to the flow of urine through the ureters as one of the important factors in the

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[1] *Zeitschr. f. Geb. u. Gyn.*, Bd. iii. p. 259.

[2] *Centralblatt f. med. Wissensch.*, No. 21, 1871; *Volkmann's Sammlung klin. Vort.*, No. 212, 1882; *Arch. f. Gyn.*, Bd. xxiv. p. 303.

[3] See also Runeberg: "Analyse der klinischen und experimentellen Beobachtungen hinsichtlich der Albuminurie," *Deutsches Archiv f. klin. Medicin*, Bd. xxiii. H. 3.

[4] *Zeitschr. f. Geb. u. Gyn.*, Bd. iv. p. 88.

[5] *Zeitschr. f. klin. Med.*, 1881, Bd. ii.

[6] *Puerperal Convalescence, etc.*, 1886, p. 137.

causation of the renal disorders, although it is impossible to accept the author's view that it is the most frequent cause.

3. Scanzoni and Frerichs have emphasized the significance as an etiological factor of the hydræmic state of the blood incident to pregnancy. But renal disorders are observed with relative frequency in young robust primiparæ (Bartels, Schroeder). It is quite possible, however, that the qualitative blood-changes sustain a predisposing causal relation to the disorders under consideration.

4. Mahomed has pointed out the significance of increased arterial tension in the production of albuminuria. In the pre-albuminuric stage of Bright's disease increased arterial tension is evident. Robert Barnes is inclined to attach great importance to this factor, at least as a predisposing cause.

5. Peter, Schroeder, and others invoke increased functional activity of the kidneys during pregnancy in the explanation of albuminuria. To this theory it may be objected that the renal excretion is not greatly increased during gestation, according to the researches of Winckel and Spiegelberg. In diabetes, a condition in which the functional activity of the kidneys is greatly increased, albuminuria and structural changes are infrequent (Burkart). When the kidneys are normal as regards structure and functions, the increased work incident to pregnancy is probably not productive of untoward results. It is, indeed, highly probable, if not actually demonstrated, that a physiological hypertrophy of the organs takes place. But if, on account of congenital defect or acquired disease, the kidneys are barely equal to the work required of them in the non-gravid state, it is perfectly obvious that even a slight increase in functional activity may disturb the balance and cause a state of relative insufficiency.

6. Tyler Smith, Cohnheim, Spiegelberg, Fleischl, and others regard many cases of eclampsia as being due to renal anæmia the result of reflex vaso-motor spasm of the renal arteries, the excentric irritant being the contracting uterus. Spiegelberg refers all cases of eclampsia in individuals whose kidneys have not been previously the loci of diffuse inflammation to this category. There are many facts which lend probability to this bold hypothesis, and from the nature of the case its positive disproof in the present state of our knowledge is impossible. The full discussion of this theory, however, will be considered under the Pathology of Labor.

These, in brief, are the more important theories with reference to the causation of the renal affections incident to gestation. For the most part, they are theories resting upon facts derived from careful clinical observation and elaborate experimentation; they are seldom mere speculative hypotheses. Not one of them, however, as before remarked, constitutes a sufficient explanation of all the phenomena. But combined they afford, not indeed an adequate solution of the problem of etiology, but indications for rational and highly successful therapeusis. The late Bartels,[1] in commenting upon this topic, wrote: "For the present there is nothing left for us but to record the fact that parenchymatous inflammations of the kidneys and the liver may be developed during pregnancy, and to confess that we do not know what causes them." A just estimate of our present knowledge condemns this dictum as pessimistic.

Before leaving this subject mention may be made of a recent hypothesis advanced by A. F. A. King.[2] "Disturbances in the renal circulation and renal functions," this observer writes, "are produced chiefly by pressure of the gravid uterus upon the abdominal aorta or its branches, or upon the vena cava or its branches, or upon both or all of these, in consequence of the child and womb not maintaining during pregnancy their normal lateral obliquity above the pelvic brim." In cases in which the head and lower uterine segment have already engaged within the pelvic cavity during the latter part of gestation, King recommends lifting the lower segment of the womb and the child's head out of the pelvic cavity toward that iliac fossa opposite to the side to which the fundus is inclined.

This remarkable hypothesis rests upon the utterly gratuitous assumption that the normal presentation of the fœtus before labor begins is the dorso-anterior position of an oblique presentation. The experience of the human race from its earliest records to the present proves that lightening before labor is an absolutely physiological occurrence. The absurdity of the transformation of a normal presentation into a pathological condition—admitting the possibility of the procedure—is obvious. The hypothesis is unworthy of serious consideration.

Pathology.—The types of renal disease to which pregnancy stands in direct or indirect causal relation are numerous.

1. Under the term the kidney of pregnancy Leyden[3] has pointed out a condition peculiar to pregnancy. The kidney is relatively large and of a pale, anæmic hue. On microscopical examination the renal epithelium gives evidence of pronounced fatty degeneration. The urine contains albumen, hyaline and granular casts, and renal epithelium showing fatty changes. Œdema is commonly present. All evidence of inflammation is absent, and the structural changes are due to anæmia.

This condition is anatomically distinguished from acute parenchymatous nephritis by the behavior of the interstitial connective tissue and the characters of the urine. In the kidney of pregnancy this connective tissue is intact; in acute nephritis it is swollen, œdematous, infiltrated with small cells, and shows proliferation. Hæmaturia is characteristic of acute nephritis, while the red blood-corpuscles are notably absent in the urine of the kidney of pregnancy.

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[1] *Loc. cit.*

[2] *Am. Journ. of Obstet.*, March, 1887.

[3] *Zeitschr. f. klin. Medicin*, Bd. ii.

Acute nephritis is of more or less sudden origin, while the kidney of pregnancy is developed slowly and often imperceptibly.

The distinction between the kidney of pregnancy and chronic interstitial and parenchymatous nephritis is much more difficult. Low specific gravity, small amount of albumen, large quantity of urine, cardiac hypertrophy, and hard pulse speak for chronic interstitial nephritis. The history of the case is of especial value in the differential diagnosis between the kidney of pregnancy and chronic parenchymatous nephritis. The latter condition is frequently a sequela of inveterate syphilis, phthisis, and malaria.

The distinction between the kidney of pregnancy and the various forms of chronic nephritis is rendered still more difficult by the probable fact that the kidney of pregnancy may be the point of departure of all the types of chronic Bright's disease. Litzmann, Hofmeier, Ingerslev, Schroeder, Möricke, and others have brought forward many clinical facts which lend strong probability to this view. On the other hand, Bartels writes:[1] "A chronic affection of the kidney never follows." Leyden and Flaischlein are of the opinion that such a transition has never been demonstrated. The latter observer regards it as *a priori* improbable. The weight of probable evidence is in favor of the first view—*i. e.* that the kidney of pregnancy may pass over into chronic Bright's disease.

2. Latent chronic interstitial nephritis, chronic tubal nephritis, and lardaceous degeneration of the kidney are usually influenced unfavorably by pregnancy, and, in turn, may lead to the interruption of that state. In this connection it is necessary to bear in mind the fact to which Carl Braun[2] has repeatedly called attention, that in the severest types of Bright's disease—atrophy and amyloid degeneration—albuminuria may be entirely absent.

3. Mixed types of chronic Bright's disease are frequently observed. Thus, the interstitial and tubal forms of the disease may be combined. Amyloid degeneration may be present with either form, and fatty changes are common in all types of Bright's disease. Eclampsia is of relatively infrequent occurrence in chronic renal disease, although anasarca and its consequences may, and frequently do, lead to the interruption of pregnancy.

4. Acute parenchymatous nephritis is, of all renal disorders occurring during pregnancy, of gravest prognostic moment. Incidental mention has been made of its more important characteristics. In this form of renal disease eclampsia is of most frequent occurrence.

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[1] *Loc. cit.*, p. 216.

[2] *Loc. cit.*, p. 827.

Symptoms.—The symptoms of the various renal disorders just mentioned are neither uniform nor constantly present. Anasarca frequently directs attention to the patient's condition long before the appearance of more significant signs. Œdematous swellings of the face, hands, arms, feet, legs, and labia majora are always suspicious appearances, and should lead at once to an examination of the urine and rigid scrutiny of the patient's general condition. These œdematous swellings are wandering—appear when the patient is lying down, and disappear when she rises and walks about. Sometimes, toward the end of pregnancy, they become less marked, not infrequently entirely disappearing, while the albuminuria is increasing. The skin covering the œdematous portions of the body is dry, of a chalky-white appearance, and the surface temperature is diminished.

Anomalous nervous phenomena—headache, vertigo, dimness of vision, spots before the eyes, ringing in the ears, sudden deafness, obstinate nausea and vomiting, insomnia, neuralgias, and the like—are often observed. These various nervous phenomena are symptomatic of urinæmia.

Convulsions, due to renal insufficiency conditioned upon functional or organic disease of the kidneys or upon urinary resorption from obstruction of the ureters, may occur during pregnancy, but are more frequently observed during labor.

All the renal disorders incident to pregnancy strongly predispose to abortion or premature labor. This topic, however, will be fully discussed in a succeeding section.

The diagnosis and prognosis of the renal disorders of pregnancy will be discussed in connection with the subject of eclampsia in a subsequent section.

Treatment.—In view of the serious complications arising during pregnancy, labor, and the puerperium from interference with the functions of the kidneys, the absolute necessity of chemical analysis of the urine at regular intervals in every case, especially during the latter half of gestation, is apparent. Evacuation of the uterine contents—that is, the removal of the cause—is the only means of effecting a radical cure. However, before resorting to this procedure, a variety of expedients, hygienic and medical, must be invoked in the palliation of the morbid conditions.

Hygienic.—The diet should be restricted to milk and non-nitrogenous foods, so far as this may be possible. The functional activity of the skin can be maintained and rendered in a very high degree compensatory to the diminished renal action. This constitutes by far the most important objective point in treatment. The systematic use of the hot-water bath[1] fulfils the indication just mentioned more adequately than any other single therapeutic agent. This very ancient method of treating renal disorders is practised with great technical perfection in Vienna. Breus[1] has well described the method as it is seen in almost daily operation in the lying-in wards of Carl Braun, Breisky, and Gustav Braun. The patient, entirely nude, is immersed up to the neck in a portable bath of a temperature of about 102° Fahr. The tub is covered with heavy woollen blankets which permit the head to protrude. The temperature of the water is then gradually elevated to 110° or 112° Fahr. An ice-bag or a linen cloth wrung out of cold water applied to the head relieves the annoying cephalic symptoms which are occasionally observed at this time. Thirst is relieved and diuresis and diaphoresis promoted by the copious imbibition of water. The patient remains in the bath about thirty minutes. She is then removed, wrapped in hot sheets, and put to bed between two layers of heavy woollen blankets, and covered in so that only the face is exposed. Profuse sweating soon begins, and is kept up for two or three hours. After this vigorous sweating the patient commonly falls into refreshing slumber. If she feels faint in the bath or bed, a glassful of one of the light native wines usually restores the circulatory equilibrium. Great care is taken in the gradual cooling off of the surface when the woman rises from the bed. According to the indications in the concrete case the bath is repeated from once to twice daily for an indefinite period. Under this simple mode of treatment wonderful results are frequently noted. The troublesome headache is relieved, dropsical effusions abate, and the amount of albumen in the urine is diminished.

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[1] Liebermeister: *Prager Vierteljahrsschrift,* 1861.

The query as to the effect of hot-water baths on uterine contractions naturally arises. Hot-water sitz-baths have been used for years in all the Vienna lying-in clinics as a simple, innocent, and efficient means of stimulating uterine contractions in tardy labors. On *a-priori* grounds it would seem in a high degree probable that the calling of all the skin reflexes into functional activity might result in the invocation of expulsive efforts of the womb. Breus was unable to observe any such effect, but chloral was at the same time exhibited per rectum in many of the cases. A. Sippel[2] has reported two cases of severe Bright's disease during pregnancy, with threatened eclampsia, in which the hot-water bath was used. In both cases premature labor followed the bath and diaphoresis within, respectively, fourteen and one and a half hours. To determine the effect of hot-water baths on the normal pregnant woman, Sippel selected a woman pregnant in the thirty-fourth week. She had a generally contracted pelvis, and the induction of premature labor was indicated. After baths on two successive days, without the subsequent packings, sensible uterine contractions occurred, but

[1] *Arch. f. Gyn.*, Bd. xix. p. 219.

[2] *Centralb. f. Gynäk.*, No. 44, Oct. 31, 1885.

gradually passed away. On the third morning pains commenced during the bath, and labor terminated normally some twenty-four hours later. In a second case[1] the effect of the bath was less marked. The writer has recently observed the induction of premature labor immediately following the hot-water bath in two cases of Bright's disease in pregnancy, with threatened eclampsia.

The possibility of the induction of premature labor by the hot-water bath must be admitted. This tendency may be limited by the exhibition of chloral and the bromides. However, the spontaneous evacuation of the uterine contents under these conditions in the majority of cases is an event for which the obstetrician most devoutly prays, so that the possibility of the premature interruption of pregnancy seldom constitutes distinct contraindication to the employment of this mode of treatment. As a method of induction of premature labor the hot-water bath is entirely devoid of danger from sepsis. Further trial, however, is necessary to determine its efficiency.

In lieu of suitable appliances for the hot-water bath, an efficient vapor bath can always be readily extemporized. A spirit-lamp and a large tin funnel with a long bent beak constitute the necessary parts of the apparatus. The patient is well wrapped up in bed, the beak of the funnel introduced beneath the bed-clothes, and the lighted lamp placed under the expanded portion of the funnel. When the lamp is large enough and the beak of the funnel is not obstructed by the bed-clothes, the space immediately about the patient is soon filled with hot air and aqueous vapor.

The lateral or latero-prone posture during sleep serves to relieve in some degree the ureters of the pressure from the gravid womb, and should be advised. Graily Hewitt, Löhlein, and Routh speak highly of this postural treatment. The genupectoral posture is doubtless much more efficient in removing pressure from the ureters, and its systematic employment merits recommendation. Postural treatment is of value before engagement of the head and lower uterine segment within the pelvic inlet. It is plainly of relatively slight importance in the diminution of intra-abdominal tension.

Medical.—The exhibition of non-irritant diuretics, such as the acetate and bitartrate of potassium, in large quantities of water, causes an increased secretion of urine and lessens renal congestion. Among mineral waters, Bilin, Giesshübel, Preblau, Selters, and Vichy deserve mention. The tincture of the chloride of iron in the form of Basham's mixture, and the fresh infusion of digitalis in connection with the potassium salts already mentioned, are the usual and most reliable combinations.

Cathartics which produce large, watery stools without much irritation supplement the action of diuretics and diaphoretics. Castor oil, the salines, and calomel, alone or in combination, commonly fulfil this indication. Elaterium, the most efficient of all hydragogue cathartics, must be used with extreme care.[1] In properly-regulated doses it produces the freest evacuations with relatively little pain and irritation. Undoubtedly, it aids in the elimination of the excrementitious matters retained within the blood. Its action, however, is exhausting, and there is considerable danger of the premature interruption of pregnancy from the drastic effects of too large a dose. It is usually safe to commence with a half grain of the trituration (U. S.), combined with one grain of the extract of hyoscyamus and a drop of one of the aromatic oils. The use of this drug is rightly restricted to the severer cases, in which symptoms of uriæmic intoxication have already appeared.

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[1] *Centralb. f. Gynäk.*, April 3, 1886, No. 14.

Jaborandi and pilocarpine are justly regarded as the most reliable and influential of diaphoretic drugs. Nevertheless, the weight of evidence is decidedly against their use in the renal complications of pregnancy. Competent testimony shows that these remedies in the renal disorders of pregnancy are uncertain in action; they often act as cardiac depressants, and frequently stand in a causal relation to pulmonary œdema. Then the effect of the drugs upon the kidney itself is a matter of moment. Purjesz[2] has noted the occurrence of albuminuria after the exhibition of pilocarpine; Wood and Stumpf have observed strangury. The drug possesses important oxytocic properties, which will be mentioned in connection with the artificial induction of abortion. In the present state of our knowledge the use of this drug is distinctly contraindicated. The same effect, with no risks, can be secured by the hot-water bath.

By a judicious combination of these varied therapeutic resources threatening symptoms may commonly be averted and the pregnancy carried along at least until the fœtus is viable, and until a time when labor may be induced with a reasonable hope of saving the child's life; that is, until the thirty-sixth week. Not infrequently, however, notwithstanding all efforts, the albuminuria steadily increases, hydræmia becomes more marked, hydropsies appear with alarming cerebral, cardiac, or pulmonary symptoms. More active treatment is indicated, and the artificial interruption of pregnancy comes up for consideration. Without entering into a discussion of the arguments for and against this procedure, let it suffice to say that clinical experience furnishes overpowering evidence in favor of the operation. When shall pregnancy be artificially interrupted? The artificial induction of abortion is very rarely indicated, since the renal disorders occur in the very large majority of cases during the second half of pregnancy, and particularly during the last three months. The exact indications will be stated in connection with the subjects of Premature Labor and Abortion. But here it may be said that when, in the concrete case, after a careful, systematic use of the therapy just outlined, especially of the hot-water bath, the symptoms do not abate, the artificial evacuation of the contents of the uterus is indicated. It is very much wiser to err in the interpretation of the indications on the side of too early operative interference than to temporize until prodromes of eclampsia or pericardial effusion occur.

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[1] H. C. Wood: *loc. cit.*, p. 517.

[2] *Deutsch. Archiv klin. Med.*, xvii. p. 533.

SKIN DISEASES.

Impetigo Herpetiformis.—Under this term Hebra[1] in 1872 described a rare skin disease, supposed to be peculiar to pregnancy, of which he encountered five examples. Grouped pustules, the size of the head of a pin, upon inflamed bases, appear in the groin, around the umbilicus, over the breasts, in the axillæ, later on other surfaces. Within one or two days these pustules dry up into dirty-brown crusts, while around them new pearl-like pustules develop in circles, which in turn dry up and increase the size of the central scab. The efflorescence is thus diffused by successive crops over the entire skin surface within a period of from three to four months. The mucous membrane of the tongue, palate, velum, posterior wall of the pharynx, and the œsophagus sometimes shows circumscribed, gray, centrically-depressed plaques. Rigors, a high remittent fever with exacerbations as new crops appear, great prostration, delirium, vomiting, characterize the disease. In one case Kaposi has noticed a prodromal erythema læve et urticatum.

The disease occurs commonly during the second half of pregnancy. As before remarked, Hebra describes the disease as peculiar to pregnancy. Kaposi[2] and Patoky, however, have observed the affection in two young men, aged respectively twenty and eighteen years. Friedr. Schwarz has seen one case in a non-pregnant woman. On account of the apparent influence of gestation in the development of the disease, it has been customary to regard impetigo herpetiformis as a neuro-reflex dermatosis analogous to pemphigus hystericus, herpes gestationis, and the like.

Neumann regards the disease as metastatic pustulosis. The large numbers of cocci, bacteria, and vibriones in the contents of the pustules, the eruption suggestive of metastasis, the high fever, and the fatal course point to the existence of an infectious disease.

Two cases observed by C. Heitzmann and Fr. Schwarz are of interest, since they indicate a certain analogy, if not an actual relation, between the disorder under consideration and pemphigus. In both of these cases, after the disappearance of impetigo herpetiformis Hebra, a rapidly fatal pemphigus was developed.

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[1] *Wiener med. Woch.*, No. 48, 1872.

[2] *Pathologie und Therapie der Hautkrankheiten*, 2te Hälfte, Wien, 1887, p. 547.

The PROGNOSIS is unfavorable. Out of 12 cases recorded in the Annals of the Vienna Dermatological Clinic, 10 terminated fatally during pregnancy. In one case the disease appeared in two pregnancies succeeding each other at brief intervals, completely disappearing in the interim. The disorder terminated in death during the third gestation. Recidiva are liable to occur. In one of the cases cited the woman apparently recovered, but within a few weeks the disease reappeared, and was followed by death. Only one case of permanent recovery is registered. The interruption of pregnancy apparently exercises no influence upon the course of the affection.

Herpes Gestationis.—Milton and Bulkley have observed and described, as peculiar to pregnancy, a pemphigoid efflorescence which they have designated herpes gestationis. Erythema, papules, vesicles, and bullæ are developed. Vesicles predominate, appearing first on the lower extremities, subsequently spreading over the body. Intense itching and burning attend the eruption. Urticaria, neuralgia, and other neurotic symptoms accompany or precede the development of the affection. The disease appears early in pregnancy, continues until term, disappears after labor, but is apt to recur with succeeding pregnancies. The constitutional symptoms are much less severe than in the impetigo herpetiformis of Hebra.

It is in a high degree probable that herpes gestationis is a reflex neurosis analogous to pemphigus hystericus, the peripheral irritant being the germinal mass in the uterus, the sensory, vaso-motor, and trophic nerves being the conductors.

The PROGNOSIS is favorable and the TREATMENT symptomatic.

Dermatitis Herpetiformis.—Duhring[1] regards both of the skin affections first mentioned as different manifestations of the same general process, which he terms dermatitis herpetiformis. Against this view numerous objections have been forcibly urged. As remarked by Kaposi, "This designation represents no well-characterized clinical picture, but merely a purely theoretical formula." It would throw together a number of diseases whose clinical course, diagnosis, and prognosis are essentially different, whose causes are in some cases known, and in others—as in impetigo herpetiformis—totally unknown.

Pruritus.—General pruritus, without any apparent skin lesion, is a rare disease of pregnancy, and is referred by Hebra to the class of idioneuroses.[2] Maslieurat-Lagemart observed a case in which general pruritus was developed in eight successive pregnancies, and became so intense that premature labor was induced. Spiegelberg narrates the history of an elderly primipara in whom pruritus was developed at the second month. The patient became so enfeebled, despite all treatment, at the end of the fifth month as the result of loss of sleep that the artificial termination of pregnancy was considered. However, she was delivered at the thirty-seventh week of a healthy child. In both of these cases the disease only appeared during pregnancy, and promptly disappeared with its cessation.

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[1] *Journ. Cut. Dis.*, Oct., 1885, p. 317.

[2] Cazeaux: *loc. cit.*

In the TREATMENT of this affection Cazeaux recommends highly alkaline baths (potassium carbonate, 150 grams to a large bath). Cocaine has also been employed with advantage.

Pruritus Vulvæ.—Itching about the genitalia in either sex, as remarked by Duhring, always demands a careful ocular examination of the parts. The symptom is commonly due to one of three conditions—eczema, pruritus, or phthiriasis pubis. The relation of diabetes mellitus and acrid vaginal secretions is well known.

The TREATMENT of course must be directed to the removal of the cause. This important topic will be considered fully in connection with the diseases of the genital apparatus during pregnancy.

NEUROSES.

Of all the neuroses in the course of pregnancy, eclampsia is of chief clinical significance. Puerperal convulsions, however, occur with greatest relative frequency during labor. For this reason the subject is usually discussed in connection with the pathology of parturition and the puerperium. The various psychoses are referred for a similar reason to the same article.

Tetany.—As defined by Berger,[1] tetany is a spastic neurosis occurring most frequently during childhood and youth, characterized by paroxysmal bilateral tonic convulsions, involving definite groups of muscles of the extremities, without alteration of consciousness, and highly increased irritability of the peripheral motor nerves upon the application of electrical and mechanical stimuli. The disease is almost always curable; a definite, anatomical basis up to the present time has not been found.

The etiology of tetany is very obscure. Trousseau asserted that pregnancy stood in a necessary relation to the disorder. Meinert, however, has been able to collect only six cases of the affection in pregnancy from the literature of the subject. Two cases were observed in I.-paræ, one in III.-para, and one in VI.-para; the ages in the six cases cited were, respectively, twenty-one, thirty-two, thirty-three, thirty-four, forty, and forty-two years. The attacks begin at all periods of gestation, and the symptom recurs in succeeding pregnancies.

The prodromes are general sensations of malaise and discomfort, with pains especially in the arms. The convulsions commonly commence in the upper extremities, and spread centripetally from the fingers to the trunk. The toes are first affected when the symptom is observed in the lower extremities. Trousseau's phenomenon—the contracture of the fingers, "like the hand of the obstetrician about to enter the vagina"—is measurably characteristic.

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[1] Meinert: "Tetanie im der Schwangerschaft," *Archiv f. Gyn.*, Bd. xxx. H. 3, p. 444.

The increased irritability of the peripheral motor nerves can be demonstrated by the application of electrical and mechanical stimuli over the course of the facial and median nerves. During the pauses between the spasms such irritants are sufficient to provoke new convulsions. Meinert has observed trophic disturbances of the nails in a single case.

The PROGNOSIS is favorable. The disease commonly ceases with pregnancy, although it frequently makes its primary appearance during the puerperium.[1]

In the TREATMENT of the condition it is necessary to eliminate all peripheral irritants—tænia and the like—and subsequently to place chief reliance upon chloral and the bromides.

Tetanus.—Tetanus, a rare affection, especially in women, is occasionally observed after abortion or labor at term. Sir James Y. Simpson has collected 27 cases, in 22 of which the disease was fatal. Bennington records 41 cases, with fatal termination in 37; in 21 of these cases tetanus followed abortion. The disease occurs with greatest relative frequency in hot climates after abortion and the removal of decidual and placental remains. Wiltshire, who reports two fatal cases, expresses the view that the retention of a portion of the fœtal envelopes may act as a causal factor in two ways: (1) by its presence as a foreign body; (2) when infected by causing a peculiar form of septicæmia.

Chorea.—Chorea is a relatively infrequent complication of pregnancy. Robert Barnes (1868) has collected 56 cases from the literature of the subject; Fehling[2] (1874) brings the number up to 68; Spiegelberg (1882) to 84.[3]

The disease is of most frequent occurrence in primigravidæ; out of 45 cases, Barnes found 28 primiparæ; Fehling, out of 53 cases, 33 primiparæ. The disease is liable to recur with succeeding pregnancies, more or less completely disappearing during the intervals. It makes its appearance commonly during the first half of pregnancy: Barnes has noted this fact in 29 out of 30 cases; Fehling, in 39 out of 55 cases.

The facts at present known with reference to the causation of the chorea of pregnancy are, briefly: (1) There is usually a predisposition to the affection, inherited or acquired; (2) inanition of the central nervous system incident to the hydræmic state of the blood in pregnancy; (3) various potential peripheral irritants in connection with the sexual organs. As remarked by Wood,[1] "The most rational explanation of the chorea of pregnancy is that it varies in its immediate pathology, the pregnancy simply producing a condition of the nervous system which predisposes it to be thrown into active chorea by various exciting causes."

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[1] Ehrendorfer: "Tetanie im Wochenbett," *Wiener med. Wochenschr.*, 1883, No. 1.

[2] *Arch. f. Gyn.*, 1874, Bd. vi. p. 137.

[3] For 3 additional cases see Osler, *Medical News*, Oct. 22, 1887, p. 465; Wasseige, *Bull. de l'Acad. Royal de Méd. de Belgique*, t. i., 1887; Hirst, *Trans. Philada. Obstet. Soc.*, Dec., 1887. See also Hervé, "De la Chorée pendant la Grossesse," *Thèse de Paris*, 1884; and Gayard, *Contributions à l'Étude de la Chorée des Femmes enceintes*, Paris, 1884.

The affection is frequently a grave complication. The movements may become so violent and incessant that the patient is deprived of sleep, and death from exhaustion threatened. The convulsive character of these movements is most marked during the uterine contractions of labor (Spiegelberg, Goodell, Mosler).

Pregnancy is prematurely interrupted in about one-half the cases. The child may be born alive and affected with the disease.

PROGNOSIS.—Out of the 84 cases cited, 23 terminated in death, chiefly as the result of complications. Mania, loss of memory, grave cerebral and spinal lesions, are occasionally traceable to this affection.

TREATMENT.—The palliative treatment of the chorea of pregnancy is unsatisfactory in the extreme. All the so-called specifics of greater or less value in the non-gravid state are frequently without influence during gestation. In over one-half of the recorded cases the most judicious combination of hygienic and medical resources have proved of no avail. In view of the prognosis, the induction of premature labor is very frequently indicated, in the interest both of the mother and the child, at an early stage of the disease. Less often the question of the artificial induction of abortion comes up for consideration. In view of the grave cerebral and spinal lesions which may result from the affection, the mother is justly entitled to the benefit of the doubt. The interruption of pregnancy, however, is not invariably followed by amelioration of the symptoms. In a case reported by Goodell the disease continued and terminated in death, notwithstanding the evacuation of the uterine contents.

Wade in one case practised Copeman's method of cervical dilatation, with apparent benefit.

Epilepsy.—Epilepsy is commonly an accidental complication of pregnancy. Spiegelberg is responsible for the observation that in chronic epilepsy pregnancy sometimes favorably modifies the course of the disorder. The seizures occur less frequently and are not so violent in character.

Acute epilepsy may be developed as the result of pregnancy when a latent predisposition, inherited or acquired, exists. The epileptogenous zone in this form of the disease frequently comprehends the distribution of the ischiatic nerve.

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[1] *Nervous Diseases*, 1887, p. 158.

The occurrence of acute or chronic epilepsy during pregnancy is of great diagnostic interest, from the resemblance of the epileptic seizures to the convulsions caused by urinæmia. The urine secreted during or after a fit may or may not contain albumen. The diagnosis is cleared up by the history of the case and the course of the affection.

Disorders of the Special Senses.

Disorders of the special senses in pregnancy are commonly symptomatic of renal disease. Apart from the disorders dependent upon lesions of the kidneys, disturbances of vision are of chief clinical interest. Amblyopia, hemeralopia, and color-blindness are occasionally observed as the result of nutritive disturbances in the retina.

The PROGNOSIS, as a rule, is favorable. The visual disorders commonly disappear during the puerperium and evince no tendency to recurrence.

II. THE PECULIARITIES OF CERTAIN ACCIDENTAL ACUTE AND CHRONIC DISEASES OCCURRING IN THE COURSE OF PREGNANCY.

It was formerly thought that the pregnant woman not only enjoyed a certain immunity from accidental diseases, but also that the course of such affections was favorably modified by gestation. Modern research, however, has abundantly demonstrated the groundless nature of this belief. It is a fully-established truth that pregnancy confers upon the individual no immunity from the disorders to which the non-gravid woman is liable Moreover, such accessory diseases are commonly aggravated by pregnancy, and in their turn unfavorably influence the course of gestation, often leading to its premature interruption.

Acute Infectious Diseases.

Of all the diseases occurring accidentally in the course of pregnancy, the acute infectious disorders are of the gravest clinical significance. These diseases are peculiarly dangerous complications for two reasons:

I. They have a marked tendency to cause the death of the fœtus, and consequently the interruption of pregnancy, at a time when the loss of blood and the muscular exertion necessary to the expulsion of the product of conception seriously imperil the mother's life.

The death of the fœtus, and the consequent interruption of pregnancy, may result from the operation of a variety of etiological factors.

1. The fœtus commonly dies in consequence of the elevation of maternal temperature. The case is a veritable example of the condition which H. C. Wood terms heat-stroke. The fœtus in its membranes,

surrounded by maternal tissues, must possess at least the same temperature as the maternal body. But then it has its own heat-producing apparatus in addition, so that the assumption of the elevation of the fœtal above the maternal temperature is justified on *a-priori* grounds. Wurster has actually demonstrated the truth of this assumption. He placed a thermometer in the anus of a fœtus presenting by the pelvis, and one in the vagina of the parturient woman, and observed a difference of half a degree in favor of the fœtus. D'Alexeef's observations in eight cases—four pelvic, four face presentations—confirm the results arrived at by Wurster. In these cases one thermometer was inserted either into the anus or the mouth of the child. Fehling found the difference in the temperature less marked.

A very slight elevation of the maternal temperature produces a disproportionate rise in the temperature of the fœtus. Kaminski[1] has shown that an elevation of maternal temperature to 104° Fahr. imperils fœtal life. Increased frequency of the fœtal heart-beats and abnormally active fœtal movements are followed by diminished cardiac and muscular activity, and the fœtus dies (Hohl, Fiedler, Winckel, Hüter). Max Runge[2] has confirmed Kaminski's observations, and concludes that the maternal temperature absolutely fatal to the fœtus in rabbits is 106.7° Fahr. Doléris[3] and Doré,[4] however, have pointed out that the rapidity with which the maternal temperature is elevated plays an important rôle in the causation of fœtal death. If the temperature of the rabbit be slowly raised, even to 109.4° Fahr., and not kept at this degree too long a period, no unfavorable effect upon the fœtus is noticeable. Runge[5] has recently accepted these criticisms.

2. Pregnancy may be prematurely interrupted, independently of the condition of the fœtus, as the result of the thermic irritation of the uterine musculature by the maternal blood. Spiegelberg on *a-priori* grounds asserted the possibility of this event. Runge's experimental investigations render the view in a high degree probable.

3. The fœtus may perish from asphyxia when the maternal blood-pressure is seriously lowered. This change in the maternal vascular tension commonly results from diminution in the force and frequency of the heart's action observed in the course of acute infectious diseases or from sudden loss of blood. Asphyxia may also be caused by structural changes in the epithelium covering the fœtal placenta, due to the elevated temperature and other alterations of the maternal blood.

4. The fœtus may perish in consequence of infection with the specific *materies peccans* of the acute disorder. Thus, it has been demonstrated

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[1] *Moskauer med. Z.*, 1867, Nos. 13–19.

[2] *Arch. f. Gyn.*, Bd. xii.

[3] *Soc. de Biologie*, 1883, Nos. 28, 29.

[4] *Arch. de Tocol.*, 1884, Mars et Avril.

[5] *Arch. f. Gyn.*, Bd. xxv. Heft. 1.

that the fœtus in utero may be infected with measles,[1] scarlet fever,[2] erysipelas,[3] typhus,[4] relapsing fever, smallpox, intermittent fever, syphilis, anthrax, and other diseases.

II. Hemorrhagic endometritis, caused in part by changes in the constitution of the blood, is not an infrequent symptom in the course of acute infectious diseases in the non-pregnant woman. In pregnancy, however, this symptom is of more constant occurrence, just as it is of graver prognostic moment with reference to the mother. Its import as a cause of abortion or premature labor, and therefore its prognostic moment so far as the fœtus is concerned, is obvious. Thus, Slavjansky[5] has pointed out the relatively frequent occurrence of hemorrhagic decidual endometritis in cholera. Following hemorrhage into the decidua, according to the time, site, and extent, pregnancy may be immediately interrupted, or secondarily as the result of the pathological changes in the placenta or membranes induced by the extravasated blood. The hemorrhage may be so severe as to jeopardize immediately the life of the mother.

Of the eruptive fevers, smallpox, scarlet fever, and measles are of especial clinical interest. Smallpox is observed most frequently. The eruptive fevers usually occur early in pregnancy, but the disposition to the severer forms and the mortality, as remarked by Spiegelberg, increase with the duration of pregnancy.

Smallpox.—Curschman[6] is of the opinion that the condition of pregnancy predisposes in a certain degree to infection with smallpox. The mutually unfavorable relation between variola and gestation consists chiefly in the distinct tendency to the hemorrhagic form of the disease. The maternal mortality is dependent, among other conditions, upon the nature of the epidemic influence. In support of this proposition Corradi quotes Esterle, who observed no deaths nor miscarriages in 15 cases of variola, while in the epidemic of 1870–72 at Milan almost all the pregnant women aborted and 5 out of 17 mothers died. Sangregorio[7] reports 65 cases of smallpox in pregnancy, 1884–87, with miscarriage in 30 and death in 26. In 40 cases of mild smallpox, 3 died and pregnancy was interrupted in 10. Out of 22 cases of confluent smallpox, 20 died, and pregnancy was interrupted in 17 before death. In 3 cases of the hemorrhagic form of the disease all died after abortion.

The outlook with reference to the fœtus is, of course, more unfavorable than the maternal prognosis. In the class of cases in which a living and viable fœtus is born the influence of the disease is interesting and instructive. The child may be born with characteristic variolous cicatrices or in the eruptive stage, or the efflorescence may make its appearance a short period, eight to ten days, after birth. The fœtus may be infected in utero, while the mother gives no apparent sign of the disease (variola sine exanthemate—Curschman). Fumée reports a remarkable case of twin pregnancy in which only one of the children gave evidence of the disease. Finally, in very rare cases the child may escape infection altogether.

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[1] Gautier: *Annales de Gyn.*, 1879.

[2] Kaltenbach: *Centralbl. f. Gyn.*, 1884. No. 44.

[3] Lebedeff: *Zeitschr. f. Geb. u. Gyn.*, Bd. xii. p. 321.

[4] Strauss and Chamberland: *Archives de Physiol.*, 1883, i.

[5] *Arch. f. Gyn.*, iv. p. 285.

[6] *Ziemssen's Handbuch.*

[7] *Transactions of the Italian Medical Association*, section on Obstetrics, 1887.

Varioloid is of much more favorable prognostic moment, both with reference to the mother and the child, the interruption of pregnancy and maternal death being exceptional events. Loth Mayer notes 4 abortions in 37 cases; Welch, 3 in 26; Sangregorio, 1 in 7.

During smallpox epidemics abortions and premature labors, accompanied by abnormally severe hemorrhages, are frequently observed when no exanthem or other sign of the disease is noticeable in the mother. The healthy child of a woman affected with variola in the course of pregnancy is commonly insusceptible to vaccinia for a long period after birth.

Prophylaxis.—In the event of a smallpox epidemic the vaccination or revaccination of pregnant women is urgently indicated. The effect of the vaccination of the pregnant woman upon the fœtus is still a subject of controversy. Thorburn (1870) successfully vaccinated a number of pregnant women, and found no insusceptibility to vaccinia in their children. Behm[1] concludes after a thorough investigation of the subject that "intra-uterine vaccination is possible but seldom." The rule in practice is obvious. It is necessary to vaccinate newborn children even when the mother has been successfully vaccinated or revaccinated during pregnancy, or even when she has passed through variola during gestation.

Pregnant women, irrespective of protection by vaccination or a previous experience of the disease, must be prevented, as far as possible, from coming within the sphere of infection of smallpox.

Measles.—Rubeola, of infrequent occurrence in the adult generally, is a very rare complication of pregnancy. Bourgeois records 15 cases; Gautier, 11; Jacquemier, Cazeaux, Grisolle, Bleynie, Underhill, Parvin, Schroeder, and others have described isolated cases. The disease is of important prognostic moment with reference to the mother, on account of the tendency to the hemorrhagic form of the disease and the danger of pneumonia. In 8 out of the 15 cases recorded by Bourgeois, pregnancy was interrupted. The disease is capable of transmission from the mother to the fœtus in utero. In Parvin's[2] case the patient was in the ninth month of pregnancy; "premature labor occurred the third day after the eruption appeared; the child was born apparently well, but in a few days had measles, and the disease proved fatal; the mother recovered."

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[1] *Zeitschr. f. Geb. u. Gyn.*, Bd. viii. p. 18.

[2] *Loc. cit.*, p. 225.

Scarlatina.—The subjects of scarlet fever and erysipelas will be considered fully in connection with puerperal fever. In passing it may be mentioned that Olshausen has collected 7 cases of scarlet fever in pregnancy. Pregnancy was interrupted in 4 of these cases, probably as the result of the elevation of maternal temperature, although the disease was transmitted to the fœtus in certain cases. The renal complications add an unfavorable element to the prognosis.

Typhoid Fever.—Typhoid fever occurs with greatest relative frequency during the early months of gestation. It is a very rare complication of the puerperium. The tendency to the interruption of pregnancy is more marked than in any of the acute infectious diseases, with the possible exceptions of smallpox and cholera. Abortion rather than premature labor is observed. Out of 98 cases collected by Kaminski, interruption of pregnancy occurred in 63; Zülzer reports 14 miscarriages out of 24 cases; Scanzoni, 6 out of 10 cases. In about 63 per cent. of the cases collected by these observers pregnancy was interrupted. The causes of abortion or premature labor are found in the elevation of maternal temperature, the hemorrhagic endometritis, the depression of maternal blood-pressure with asphyxiation of the child, and perforation (Kleinwächter). The transmission of the infection from the mother to the child must be regarded as possible, although not demonstrated.

The maternal prognosis depends largely upon the stage of the disease in which the interruption of pregnancy occurs. If the interruption of pregnancy occur early in the course of the disease, the outlook is naturally more favorable than if the event takes place later, when the patient is in a critical state of exhaustion.

Relapsing Fever.—Murchison asserts that pregnancy is invariably interrupted in cases of relapsing fever. Weber's[1] researches, however, indicate that this assertion is entirely too general. This observer has collected 63 cases of pregnancy complicated by relapsing fever. Gestation was interrupted in 23 cases, or 36.5 per cent. Hemorrhagic endometritis is of less frequent occurrence than in typhoid fever, fœtal death commonly resulting from elevation of temperature and the effect of the specific cause of the disease. Spirilla have frequently been found in the fœtal blood (Wyss-Ebstein, Albrecht, and others).

Typhus Fever.—Murchison records 107 cases of typhus occurring in pregnancy from 1862–70. Out of these cases 49, or about 46 per cent., aborted. The disease was fatal to the mother in 9 cases. Neuhaus[2] has demonstrated the presence of bacilli, alleged to be characteristic of the disease in the fœtal blood.

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[1] *Berlin. klin. Woch.*, vii., 1870, p. 22

[2] *Ibid.*, 1886, No. 24.

TREATMENT.—In the treatment of the acute infectious disease just mentioned the symptom of pyrexia is entitled to special attention, and the use of the cold-water bath deserves particular recommendation.

Malarial Fever.—The general belief that pregnant women enjoy a certain immunity from malarial fever seems to have some foundation in fact. This apparent immunity is doubtless due in a large degree to the environment and freedom from exposure to the malarial poison. Ritter,[1] Griesinger,[2] Goth,[3] and others, however, are of the opinion that malarial toxæmia is of as relatively frequent occurrence in the pregnant as in the non-gravid woman. In latent chronic malarial poisoning gestation may be the cause of the explosion or acute exacerbation of the affection.

The course and symptoms of malarial fever are not materially modified by the coexistence of pregnancy. The effect of malaria on the course of pregnancy, however, is very different and distinctly unfavorable. Ritter, indeed, asserts that he has never observed the interruption of pregnancy as the result of malarial affections. The observations of Griesinger, Goth, Bonfils,[4] and others are conclusive upon this point. Out of 881 pregnant women observed by Goth during six years (1873–79), 47 were subject to malarial affections. In 19 cases, or 41.3 per cent., pregnancy was interrupted. Premature labor rather than abortion was noted—an observation confirmed by the terminations in the 140 cases collected by Bonfils. In the cases of abortion the causes of the interruption of pregnancy are to be found in the rapid elevation of maternal temperature, maternal anæmia, and the infection of the fœtus. When premature labor occurs the explanation consists in the thermic irritation of the uterine musculature, which Gusserow[5] has shown to be an important etiological factor in the same accident in typhus.

Direct evidence of the infection of the fœtus is adequate, entirely apart from the probability of the fact derived from analogy. The body of the dead fœtus shows the characteristic lesions of malarial toxæmia. Goodell, Harris,[6] and others record cases in which periodical convulsive movements of the child occurred at the same time with, and at different times from, the maternal paroxysm. Duchet[7] narrates the history of a case in which a pregnant woman suffering from quotidian intermittent gave birth to a premature child. The infant died of malarial toxæmia within a few hours of its birth. Goth found the average weight of mature children born of mothers infected with malaria to be 2936 grm., while the average weight of children born of perfectly healthy women in the same clinic was 3605 grms. The mortality of such children, moreover, was found to be much greater.

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[1] *Virchow's Archiv*, 1867, Bd. xxxix. p. 14.

[2] "Infectionskrankheiten," *Virch. Handbuch.*

[3] *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. p. 17.

[4] *Thèse de Paris*, 1885.

[5] *Berl. klin. Wochenschr.*, 1880, No. 17.

[6] *Am. Journ. of Obstet.*, vol. ii.

[7] *Prag. Vierteljahrsschr.*, iv. p. 95.

The influence of malarial affections upon labor and the puerperium will be fully considered in another article. During the puerperium the paroxysms lose something of their rhythmical character. Chills are of irregular occurrence, and the fever assumes a remittent or continued type.

Malarial fever during pregnancy in very rare cases assumes a pernicious type, and then may stand in a certain causal relation to the essential anæmia of pregnancy, of which mention has already been made.

In the TREATMENT of malarial affections during pregnancy the same principles obtain as in the non-gravid state. Large doses of quinine are indicated. Spiegelberg points out the important fact that owing to the impairment of the digestive and assimilative functions only a portion of the quinine is absorbed. The notion that quinine is an abortifacient is as old as the medical history of the cinchona alkaloids. The researches of Chiara, Bompiani, Henry F. Campbell, Fordyce Barker, Howard, Tarnier, Deboné, Budin, and others prove that quinine, even in the largest therapeutic doses, is not abortifacient in malarial fever nor in health.

Yellow Fever.—S. M. Bemiss[1] of New Orleans draws the following conclusions with reference to the relations between yellow fever and pregnancy, from personal observation:

1. "Pregnant women are neither more nor less liable to the disease than the non-gravid.

2. "When pregnant women are attacked by yellow fever the danger of fatal results is so much increased that one might almost say it is exceptional for recovery to occur. But this strong statement of danger ascribable to pregnancy is applicable to severe epidemic visitations, and includes all cases treated in hospitals and in the various social conditions of private practice. In recalling the events which have occurred in the ordinary run of private practice in the best districts of this city, I can safely say that I have not lost over 33 per cent. of pregnant patients. This is something more than double the percentage of mortality of the non-pregnant. We may therefore safely postulate the danger to the pregnant woman as being double that of the non-gravid.

3. "The dangers attending pregnancy are to be ascribed to the great liability to abortion and death from hemorrhage. Perhaps liability to

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[1] Parvin: *Science and Art of Obstetrics*, p. 222.

suppression of renal secretion and death from uræmia may also be greater. Embolism and thrombosis are quite common events in protracted cases of yellow fever, but I have no recollection of such accidents in any pregnant woman in my practice.

4. "The pregnant woman being attacked by yellow fever and recovering without miscarriage, immunity from future attacks is conferred upon the offspring contained in the womb during the attack. This is an extremely interesting proposition. I regret that I have only three accurate observations which support it, but I believe that further investigations will confirm its truth.

5. "The recently-delivered woman is more liable to be attacked by yellow fever than one differently circumstanced, both being equally exposed. I cannot establish this proposition by any indisputable facts. It is a current belief among those who have observed much yellow fever that traumatic conditions invite attacks of yellow fever. My own observations support this opinion, and more especially as it relates to the parturient woman.

6. "The recently-delivered woman, being attacked by yellow fever, encounters an increased degree of danger nearly or quite equal to that of the pregnant woman."

Cholera.—Pregnant women evince neither proclivity to nor immunity from cholera. As in variola, the disposition to, and the mortality of, the disease increase with the duration of pregnancy. The prospect of recovery is especially unfavorable during the sixth and seventh months. Pregnancy is commonly interrupted when the woman survives the terribly rapid course of the disease. Many women die with the product of conception in the uterine cavity. Very exceptionally, in the milder forms of the disease recovery may occur without the interruption of gestation. The causes of abortion or premature labor consist in the constant hemorrhagic endometritis, and the death of the fœtus from asphyxia as the result of the changes in the pressure and constitution of the blood. The spasms of the abdominal muscles and diaphragm (Bouchut) play a subordinate rôle. Bühl, Gutterbock, and others are of the opinion that the infection is transmitted by the mother to the fœtus in utero.

Syphilis.—Syphilis,[1] acquired at the time of fruitful coitus or during the course of pregnancy, is characterized by the brief duration of the stage of incubation, the intensity of the initial lesions, and the mildness of the consecutive symptoms. The period of incubation is commonly two weeks, exceptionally six weeks. The initial lesion develops rapidly and extensively, not infrequently involving the vulva, vagina, vaginal portion, nates, and inner surfaces of the thighs. The symptoms are marked local reaction, reddening and excoriation of the skin and mucous membrane, swelling, œdema, eczema, follicular abscesses, and necrosis of the connective tissue. The intensity of the initial lesions is due to the anatomical relations of the genitalia during pregnancy and to the greatly increased nutritive activity of the parts.

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[1] Sigmund: *Weiner med. Presse,* xiv., 1873, No. 1.

The consecutive symptoms are unusually mild. The progressive glandular infiltration proceeds slowly from the genitalia, while the erythema is of short duration, and may remain confined to the skin covering the mammæ and anterior abdominal wall. Affections of the palate, tonsils, and pharynx, laryngitis, iritis, alopecia, are observed with comparative infrequency. Syphilitic fever is seldom observed. Bäumler,[1] indeed, is of the opinion that pregnancy exerts an unfavorable influence upon the course of syphilis. Sigmund's observations, however, are conclusive upon this subject.

The prognosis with reference to the child is more favorable in syphilis acquired during pregnancy than when the disease exists before impregnation. According to the observations of Mewis,[2] about one half the pregnancies continue until term. The nearer term that syphilis is acquired, the greater is the probability that pregnancy will not be prematurely interrupted. Mewis is responsible for the assertion that syphilis acquired during the first six months is much more prejudicial to the fœtus than when infection occurs later.

Infection of the child may occur during its passage through the parturient canal in labor, as in the case recorded by Weil.[3] This mode of infection is highly exceptional.

Constitutional Syphilis.—The influence upon the fœtus of syphilis acquired before pregnancy, and which has become constitutional, is marked and always unfavorable. The fœtus may be infected through the ovum or the spermatozoid. The infection may be transmitted from the mother through the placenta to the child, and, on the other hand, from the latter to the former through the same medium.

The following propositions, substantially those formulated by V. Bärensprung in 1864, may be accepted as approximately true:

1. When the mother is perfectly healthy, but the father is affected with constitutional syphilis, the fœtus is infected by the spermatozoids. The intensity of the fœtal disease will depend upon the age and latency of the paternal affection. The disease may be communicated to the mother by the fœtus in the mode termed by Ricord and Diday *choc en retour*, without the appearance of the primary lesion and without marked external manifestations. The severer cases of hereditary syphilis frequently originate in this manner.

2. Women affected with constitutional syphilis are less liable to con-

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[1] *Ziemssen's Handbuch.*

[2] *Zeitschr. f. Geb. u. Gyn.*, Bd. iv. p. 10.

[3] *Deutsche Zeitschr. f. Pract. Med.*, 1877, No. 42.

ceive than perfectly healthy individuals. When conception does occur, the ovum is infected before its fertilization. The fœtus commonly dies in utero or is prematurely expelled.

3. When both parents are affected with constitutional syphilis, the disease is communicated to the fœtus as indicated in the first proposition. When the parental disease is old and latent, an apparently healthy child may be born, and under exceptionally favorable conditions the disease may not be transmitted at all. Evidences of hereditary syphilis, however, are usually manifested before puberty.

4. According to the intensity of the infection, the fœtus dies in utero, causing abortion or premature labor, or is born alive with manifestations of hereditary syphilis, very seldom acquired, or may first give evidence of the inheritance of the disease after a variable interval of from weeks to months.

The important question in practice, Whether an apparently healthy woman who has given birth to a syphilitic infant may be permitted to suckle her child? can usually be answered in the affirmative. In such cases the maternal disease may commonly be assumed to exist, but to be latent. As remarked by Zweifel,[1] only 3 cases are recorded in which the child under these conditions, has infected the mother. According to the so-called Colles' law, infection of the mother under these conditions never occurs. The apparently healthy child of a woman who has acquired syphilis late in pregnancy ought not to be suckled by the mother, since it is quite possible that the infant may have escaped infection.

Treatment.—Fortunately, syphilis as a complication of pregnancy is usually a very tractable affection. The premature interruption of gestation and the effect of the poison upon the fœtus may be favorably modified in the large majority of cases by appropriate specific treatment. Mercurial inunctions are preferable to the exhibition of the remedy *per os*. Iodide of potassium must be used with extreme caution, on account of its effect in the provocation of uterine contractions. The local primary or consecutive lesions deserve attention, since the child may be infected during its passage through the parturient canal.

Diseases of the Heart.

The mode in which pregnancy, parturition, and the puerperium exert an unfavorable influence upon chronic heart diseases is still the subject of much difference of opinion. Spiegelberg accounts for the disastrous results attending aortic insufficiency, observed especially in the second half of pregnancy, on the ground of inadequate compensatory hypertrophy of the left ventricle. The intercalation of the placental circulation, the increase in the blood-mass, blood-pressure, and intra-abdominal tension, throw an additional amount of work upon the left heart, to the performance of which it is entirely unequal. Accordingly, irregular heart-action and dyspnœa, followed sometimes by the interruption of pregnancy, less frequently by sudden death, ensue.

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[1] *Lehrb. d. Geburtshülfe*, 1887, p. 285.

After labor and the elimination of the placental circulation arterial tension is lowered, venous blood-pressure is elevated, and the right heart is menaced. In mitral insufficiency and dilatation of the left ventricle, without compensatory hypertrophy of the right heart, the effect of these sudden variations in blood-pressure is especially grave. Dyspnœa, pulmonary œdema, general anasarca, albuminuria, ascites, pleural effusions, are among the symptoms occasionally observed. Fritsch[1] is of the opinion that these phenomena are very frequently due to the sinking of intra-abdominal pressure, the accumulation of blood in the great abdominal vessels, and cardiac paralysis from insufficient blood-supply.

During labor, one of the chief sources of danger in all valvular defects consists in pulmonary œdema.

Löhlein and Kleinwachter[2] believe that the great danger from chronic heart disease with valvular defects occurs during the puerperium, and lies in the tendency to the recurrence of the original endocarditis.

The increased dangers of chronic valvular disease, directly or indirectly traceable to pregnancy, are so numerous, serious, and inevitable that marriage and maternity ought not to be permitted before the individual in the concrete case is clearly informed of the risks entailed.

Treatment.—The general therapy of chronic heart disease is not different from the treatment in the non-gravid state. The induction of premature labor may become necessary, but the nature and limitations of this indication must be considered in another article. During labor early recourse to the forceps or version and extraction is indicated in the interest both of the mother and the child.

Pulmonary Tuberculosis.

Contrary to the formerly received opinion, it is now a well-established fact that pregnancy exercises, as a rule, a distinctly unfavorable influence on hereditary or acquired pulmonary tuberculosis. Latent tendencies to the disease are developed and the progress of the existing affection is hastened. These effects upon the course of phthisis are observed most frequently between the ages of twenty and thirty years, although of not rare occurrence between thirty and forty. To these generalizations there are occasional exceptions. The disease is sometimes, very rarely, observed to make no progress during gestation, and the patient may decidedly improve during the lying-in period. The puerperal phases, as remarked by Spiegelberg, exercise such varied influences upon the development and course of tuberculosis that it is an imperative necessity to individualize in every case.

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[1] *Arch. f. Gyn.*, Bd. viii. p. 373; *Ibid.*, Bd. x. p. 270.

[2] *Grundriss d. Geburtshülfe*, 1881, p. 190.

When the disease progresses during pregnancy abortion or premature labor may take place or the woman may die undelivered. Infants born of tuberculous women are usually weak and sickly, and frequently perish during the first months of life. For these reasons it is an established rule of practice to inform women of the tuberculous diathesis of the danger entailed by the marital relation. The infection of the husband is observed with sufficient frequency to constitute a formidable objection to marriage. A woman affected with tuberculosis ought never to suckle her child. As a rule, however, there is seldom any necessity for such a warning, as the function of lactation is rarely established in tuberculous women.

DISPLACEMENTS OF THE GRAVID WOMB.

ANTEFLEXIONS AND ANTEVERSIONS.

During the early months of pregnancy the normal anteversion or mobile anteflexion of the uterus is increased, and certain functional disturbances in connection with the bladder and rectum often arise from mechanical pressure.

Pathological anteversions of the pregnant uterus while that organ is contained within the pelvic cavity are of extremely rare occurrence. In the absence of pelvic tumors, exudates, or antecedent anterior displacement they are commonly conditioned upon a large pelvis with relatively great conjugate diameters (Ahlfeld), retraction of the utero-sacral ligaments, and unusual development of the anterior uterine wall, aided by the intra-abdominal pressure applied over the posterior wall. Under the expression "inclination of the pelvic canal" Kiwisch designates the angle which the plane of the inlet forms with the posterior surface of the pubic symphysis. Normally, this angle measures about one hundred degrees. When the symphysis tends to assume a vertical direction, this angle becomes more obtuse, and a condition favoring anteversion and incarceration is presented. Tarnier[1] describes "a sort of tension, or even of contracture, which involves the vaginal vault and broad ligaments, so that the uterus is absolutely immobilized in its vicious direction." Very rarely the anterior dislocation of the pregnant womb may be acute, the result of traumatism, as in the cases cited by Moreau and Hüter. Morbid, immobile anteflexions of the pregnant uterus are almost invariably examples of the persistence of a pathological state acquired before conception.

SYMPTOMS.—Frequent urination on account of the mechanical obstacle to the distension of the bladder, vesical tenesmus, dysuria, incontinence, and constipation first attract the patient's attention to her condition. Cazeaux, Graily Hewitt, and others have emphasized the causal relation of uterine displacements in general, and of anteflexions in particular, to the pernicious vomiting of pregnancy. Incarceration and retention of urine seldom if ever occur in the absence of other morbid conditions, although the displacement behind the symphysis may persist in exceptional cases as late as the fifth month. Ahlfeld,[1] indeed, describes two cases of anteflexion of the pregnant uterus in which hemorrhages occurred, but the alarming symptoms ceased upon the assumption of the horizontal position. The anatomical relations of the pubic symphysis, the small expanse of the vesicouterine ligament as compared with that of the cul-de-sac of Douglas, the alternate distension and evacuation of the bladder, and the posture of the woman in rest,—all tend to prevent incarceration. Commonly, the uterus ascends spontaneously into the abdominal cavity, and the symptoms referable to the bladder and rectum cease. Anteversions, and in particular anteflexions, alone or in connection with the concomitant endometritis, often sustain a causal relation to sterility, but very seldom lead directly or indirectly to abortion.

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[1] Tarnier et Budin: *Pathologie de la Grossesse*, Paris, 1886, p. 60.

Manual reduction of the displacement, regulation of the functions of the bladder and rectum, rest in the dorsal decubitus, commonly fulfil all indications for treatment. It is seldom necessary to introduce a pessary, although the fact of pregnancy does not constitute a positive contraindication to the use of an appropriate instrument.

Toward the end of pregnancy a peculiar form of anteversion, usually associated with anteflexion, constituting the so-called pendulous abdomen, is liable to occur. This anomaly consists in an abnormal yielding of the anterior abdominal wall before the intra-abdominal tension and the weight of the gravid womb. In the higher degrees of the displacement a diastasis of the recti muscles is effected, and the pregnant womb, covered only by skin and fascia, protrudes to a variable extent through this space. Occasionally, the organ is dislocated to such a degree as to rest upon the thighs of the patient, constituting a true abdominal hernia. All conditions which tend to diminish the integrity and tonicity of the muscles of the anterior abdominal wall are predisposing factors. Accordingly, the deformity is observed more frequently among multigravidæ than primigravidæ. Cicatrices from operations or injuries often yield during the course of pregnancy and become the sites of eventration. Pelvic contraction, however, is the most important causal agent. The engagement of the presenting part and the fixation of the lower uterine segment are prevented, and the uterus, relatively free in the abdominal cavity, is pushed forward by the contractions of the diaphragm and the pressure of the intestinal mass. This effect is increased by lordosis of the lumbar vertebræ, diminishing the distance between the pubes and the ensiform cartilage and great inclination of the pelvis.

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[1] *Arch. f. Gyn.*, Bd. xiii. p. 161.

The SYMPTOMS are of a mechanical nature, and consist in pains in the stretched skin, excoriations in the cutaneous foldings, œdema of the lower portion of the abdominal surface, functional disorders in connection with the bladder and rectum, difficulty in locomotion. The higher degrees of pendulous abdomen are of considerable moment in the determination of oblique presentations of the fœtus.

The TREATMENT consists in the manual rectification of the anteversion, and the retention of the uterus in its normal position by means of a neatly-fitting binder. During labor the dorsal decubitus, elevation of the displaced organ, and retention in situ, especially during pains, until engagement of the presenting part and fixation of the lower uterine segment, commonly answer all therapeutic requirements. Operative interference is often indicated on account of the failure of the contraction of the abdominal parietes or by reason of pelvic deformities.

RETROVERSION.

Retroversion is a relatively infrequent permanent displacement of the unimpregnated uterus. It is often, but by no means invariably, a cause of sterility; so that if the uterus is found retroverted in pregnancy the inference is not justifiable that an accident has probably occurred after the beginning of gestation. In the event of conception, spontaneous rectification commonly takes place before the end of the third or fourth month, or the retroversion is converted into a retroflexion as the result of the softening and other textural changes incident to pregnancy and the resistance opposed to the cervix. In many cases the axis of the cervix forms with the axis of the corpus a curved line with its concavity downward, and the uterus assumes the shape of a retort (Spiegelberg).

RETROFLEXION.

Retroflexion of the unimpregnated uterus is one of the most frequent displacements in women who have borne children, but it is seldom the cause of acquired sterility. Out of 79 cases of retroversion of the gravid uterus, Charles[1] found that 13 occurred in primiparæ and 66 in multiparæ. On the other hand, this malposition is rare in women who have not borne children, but is a potent cause of barrenness.

While the normal position of the gravid womb is probably one of anteversion or mobile anteflexion, it must not be forgotten that

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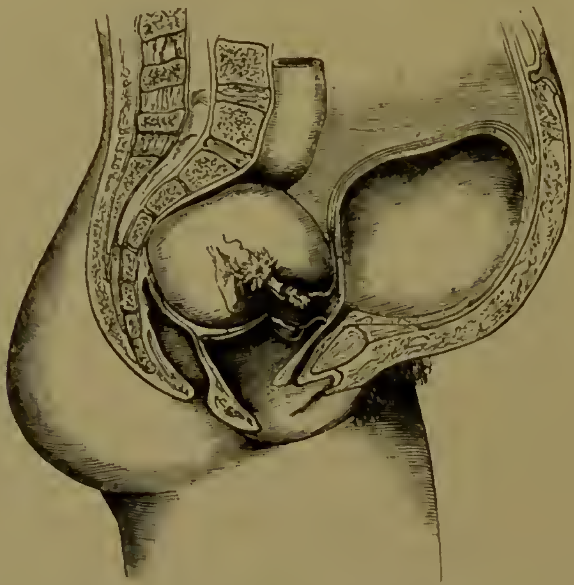
[1] *Des déplacements de la matrice en arrière pendant la grossesse*, Paris, 1878.

Braune's frozen section of a finely-formed primipara, with firm tissues and strong muscles, in the eighth week of pregnancy (see Fig. 210), shows the "body of the uterus sharply bent against its neck and turned backward." The texture of the uterus was absolutely normal, and Braune expresses the view that this was the position of the organ before death.

FIG. 209.



Retroflexion of the Gravid Uterus, schematic (Schultze).

CAUSES.—Tyler Smith[1] has shown that retroflexion of the gravid uterus presupposes a retroflexion of the unimpregnated organ in the very large majority of cases. At the same time, it cannot be denied that sudden and considerable increase in intra-abdominal pressure, as in severe vomiting or after a fall, may constitute a cause adequate to the acute retroversion of an organ already slightly prolapsed and in a position of reclination. The distended bladder, an important adjuvant under these conditions, is never in itself sufficient to the production of such a displacement.

SYMPTOMS, COURSE, AND TERMINATIONS.—According to the cause of the displacement, symptoms are commonly developed gradually, and only in exceptional cases suddenly. As the uterus increases in size the functional disturbances in connection with the bladder and rectum, so frequently present during the first three months of pregnancy, are augmented. The woman complains of a sensation of weight and fulness in the pelvis, of pains, paroxysmal or constant, radiating along the nerve-trunks of the sacral and lumbar plexuses, of bearing-down

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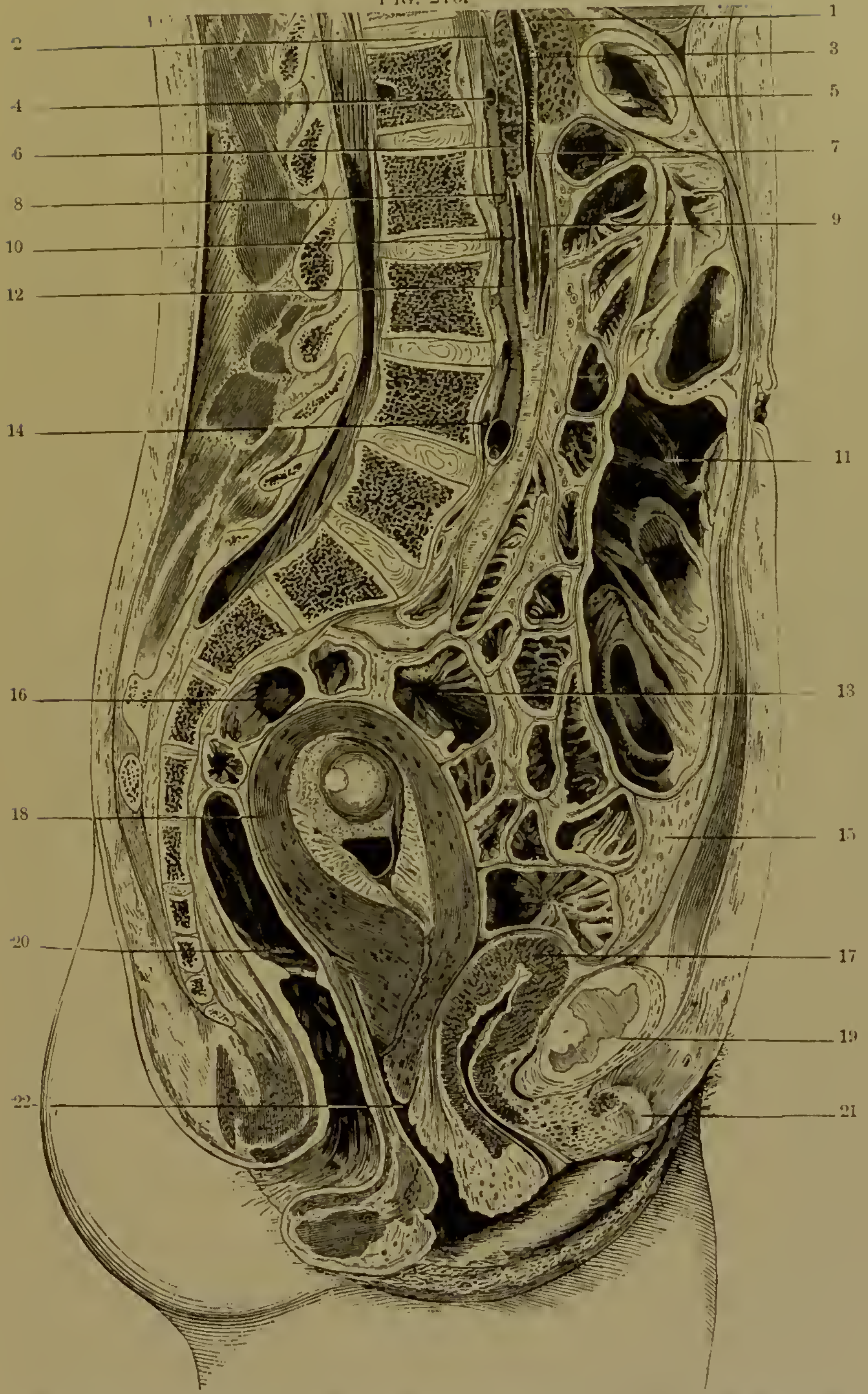
[1] *Obstetrical Transactions*, vol. ii.

FIG. 210.



Plane Frozen Section of a Finely-formed Primipara in the Eighth Week of Pregnancy (Braune): 1, pancreas; 2, left renal vein; 3, splenic vein; 4, right renal artery; 5, stomach; 6, minor pancreas; 7, superior mesenteric vein; 8, right internal spermatic artery; 9, superior mesenteric artery; 10, duodenum; 11, transverse colon; 12, abdominal aorta; 13, iliac flexure; 14, left common iliac vein; 15, major omentum; 16, rectum; 17, urinary bladder; 18, uterus; 19, symphysis pubis; 20, rectum; 21, clitoris; 22, vagina.

efforts, of unusual difficulty in locomotion. Various reflex phenomena, of which vomiting is especially noteworthy, are often present.

Intense pain, referred to the hypogastric and pelvic regions, a variable degree of shock, retention of urine, vomiting, and sudden inability to walk commonly mark the occurrence of the very rare accident of acute retroversion or retroflexion.

Bimanual examination reveals the cervix elevated behind or above the symphysis, while the smooth, round tumor of characteristic consistence, corresponding to the corpus, occupies the cul-de-sac of Douglas. The anterior vaginal fornix is empty, and the hypogastric region free from any circumscribed enlargement after the catheterization of the bladder. The catheter shows this organ displaced downward and backward.

Retroflexion of the gravid uterus ends in spontaneous rectification, abortion, incomplete rectification, or the organ becomes incarcerated.

Spontaneous Rectification.—In the majority of cases the uterus continues to grow in size until the pelvic cavity is no longer able to contain it, when the fundus elevates itself and passes up over the promontory in the direction of least resistance, and the backward displacement is substituted within a few days by the normal anteversion or anteflexion. Doubtless, in this spontaneous elevation the fundus is aided, as Spiegelberg says, by the musculature of the round and broad ligaments. This change commonly occurs without the consciousness of the patient. Spontaneous cure may result in this manner, even though extensive peritoneal adhesions and exudates into the pelvic connective tissue are present. These morbid products frequently undergo a kind of evolution analogous to that in the tissues of the genitalia, yielding and stretching before the growing womb.

In certain cases the process of spontaneous rectification is extraordinarily protracted. The anterior uterine wall grows upward into the pelvis major until larger and larger portions of the uterus and fœtus are contained within the abdominal cavity. Finally, the over-weight of the abdominal mass lifts the remainder of the uterus and fœtus out of the pelvic cavity. It is not possible to fix with certainty the ultimate limit in point of time at which spontaneous reduction may take place, especially if the process is protracted. As a rule in practice, however, it may be assumed that if the organ has evinced no tendency to elevation before the end of the third month, one of the other terminations will ensue.

Abortion.—Abortion ranks only second in frequency among the terminations of retroflexion of the gravid uterus. In habitual abortion before the third month retro-displacements constitute a very common and important cause. The factors immediately concerned in this accident are the complicating metritis—predisposing to expulsive contractions—and endometritis, and the hyperæmia and hemorrhages into the decidua consequent upon the venous stasis from the retroflexion. The mechanical hindrance to the growth of the uterus opposed by the pelvis is of much less causal moment. Spiegelberg has made the interesting observation that during the expulsion of the ovum the retroflexion is diminished to a reclination, and that the uterus remains in this position for a short time after its evacuation—a fact which demonstrates the adjuvant effect of the musculature of the round and broad ligaments, as well as of the womb, in the act of spontaneous rectification. The separation and expulsion of the ovum, together with the superficial layers of the decidua, under these conditions is usually complete, and the termination is justly considered favorable. However, the danger of retention of portions of the fœtal envelopes and of imperfect drainage is considerably greater than when the uterus occupies its normal position. Extraordinary care is accordingly indicated in the thorough evacuation and permanent disinfection of the cavum uteri.

Fig. 211.

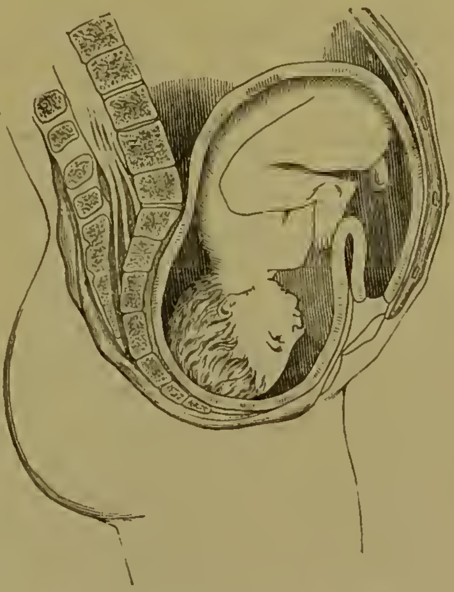


Diagram of Partial Retroflexion (Oldham).

Incomplete Retroflexion. — In very rare cases the process of spontaneous rectification is incomplete, and that portion of the uterus which fills out the pelvic cavity persists in situ. This condition is variously known as partial retroflexion or retroflexion in the second half of pregnancy. The cervix is found close behind or above the symphysis, the postero-inferior portion of the uterus is wedged into the cul-de-sac of Douglas, between the cervix and the promontory, by the presenting part, usually the head, while the greater portion of the uterus and of the fœtus is contained within the abdominal cavity above the inlet.

A perfectly distinct morbid state of the uterus which closely simulates in certain symptoms partial retroflexion is occasionally observed during the last two months of pregnancy, and has received from Wigand the appellation of sacciform dilatation of the posterior uterine wall. Scanzoni[1] regards this condition as an error of form rather than as a displacement, and as caused by the descent of the postero-inferior portion of the lower uterine segment into the fossa of Douglas under

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[1] *Lehrb. d. Geburtshülfe,* Bd. ii. p. 38, 1867.

the pressure of the presenting part. It is observed, according to this author, especially in cases of pendulous abdomen when the inclination of the pelvis is relatively slight. The over-weight of the child's pelvis and trunk, protruding forward beyond the normal plane, directs the head toward the hollow of the sacrum, and drives the relaxed uterine parenchyma downward and backward before the presenting part. Depaul[1] refers sacciform dilatation of the posterior uterine wall to certain morbid states acquired before or during pregnancy, of which flexions in general and anteflexions in particular are the more important. The posterior uterine wall undergoes a higher degree of evolution than the anterior, because its tissues are more nearly normal and because it is more distended. Little by little, the postero-inferior portion of the lower uterine segment descends into the pelvic cavity, while the anterior wall and the neck are elevated. The condition here outlined is not hypothetical. Apart from the actual observation and clear description of examples of the anomaly by Mende, Kiwisch, Scanzoni, Frank, Wigand, Chailly, Hyernaux, and others, its analogue has been seen in the anterior uterine wall. Thus, Spiegelberg[2] clearly points out the clinical features of sacciform dilatation of the anterior wall of the lower uterine segment.

While the symptoms of posterior obliquity or sacciform dilatation of the posterior uterine wall are, as a rule, relatively insignificant (Scanzoni), partial retroflexion is frequently attended by an exaggeration of all the pressure-disturbances which are observed in cases of posterior displacements during the first three months. In particular, there is grave danger of compression of the ureters and consequent disease of the kidneys, as illustrated in a case reported by Robert Barnes.[3]

The course and terminations of partial retroflexion of the gravid uterus are various. Spontaneous rectification late in pregnancy is occasionally observed. Abortion or premature labor is of more frequent occurrence. Out of 11 cases collected by Veit,[4] pregnancy was prematurely interrupted in 5. Symptoms of incarceration are liable to appear at any time. Finally, pregnancy may continue until term. In 5 of the cases collected by Veit labor took place at the expiration of the full period of utero-gestation. W. S. Stewart[5] has recently reported an interesting case of pregnancy in a partially retroflexed uterus continuing until term, and ending favorably both to mother and child.

During labor grave complications commonly arise, since the axis of the cervix, displaced upward and forward behind or above the symphysis, does not coincide with the axis of the parturient canal, and the presenting part, under the influence of uterine contractions, drives the

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[1] *Arch. Tocol.*, 1876.

[2] *Loc. cit.*, p. 265.

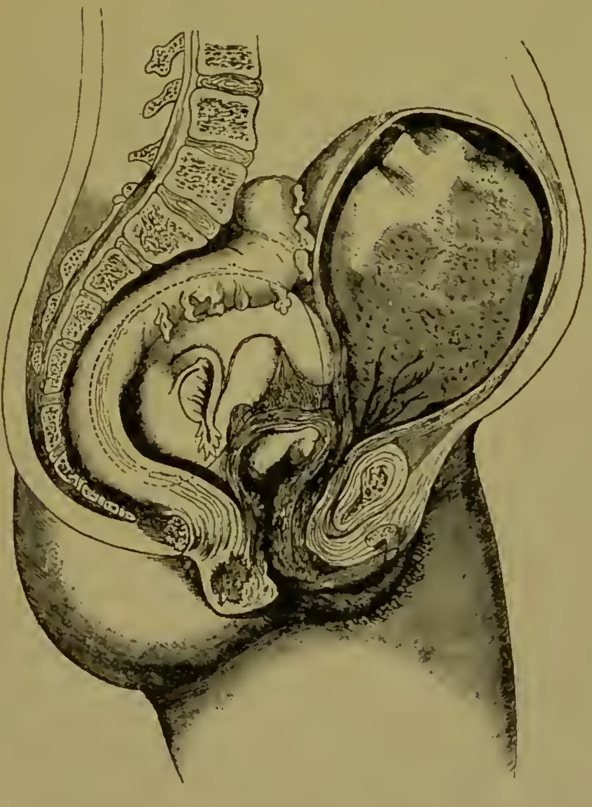
[3] *Loc. cit.*, p. 262.

[4] *Volkmann's Sammlung klin. Vortr.*, 1879, No. 170.

[5] *Trans. Ninth International Medical Congress*, 1887.

posterior diverticulum downward against the pelvic floor and perineum. Even at this time spontaneous elevation of the pouch occupying the pelvic cavity may occur under powerful labor-pains prolonged through a considerable period of time and the normal retraction of the lower uterine segment. In other cases the postero-inferior segment of the uterus may be ruptured, or labor comes to a standstill with the usual fatal consequences unless timely assistance is rendered. The attachment of the placenta to the portion of the uterine parenchyma contained within the pelvis is an additional source of danger; the organ usually requires manual extraction (Credé).

Fig. 212.



Retroflexion of the Gravid Uterus—Exfoliation of the Vesical Mucous Membrane (Schatz).

Diagnosis.—The recognition of partial retroflexion and sacciform dilatation of the posterior uterine wall commonly involves no especial difficulty when the half hand is introduced into the vagina. Conglutination[1] of the external os may in exceptional cases closely simulate the conditions under consideration. However, the cervix can always be discovered in partial retroflexion after a careful search; and this finding is sufficient to clear up all obscurity in diagnosis.

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[1] Depaul committed this error in diagnosis (Obs. II.). He was unable to find the os uteri in a case of labor, and made an incision through what subsequently proved to be the postero-inferior uterine segment. The patient died with the fœtus in utero.

It is never easy, and frequently impossible, to distinguish between partial retroflexion and sacciform dilatation of the posterior uterine wall during pregnancy and labor. The history of the case yields the most important data. When the uterus is evacuated direct examination of the posterior uterine wall discloses the true nature of the state. So far as treatment is concerned, this information is of comparatively slight moment.

TREATMENT.—During pregnancy the treatment is expectant, and consists in the alleviation of the vesical symptoms and obstinate constipation. The systematic employment of the genu-pectoral posture, together with gentle manipulation per vaginam and per rectum, according to the indications in the concrete case, aids in the process of spontaneous restitution. During labor these efforts at taxis may be more energetic, the half hand being introduced into the rectum in the attempt to elevate the posterior diverticulum, while the other hand, applied to the abdomen above the pubes, displaces the cervix and anterior portion of the lower uterine segment downward. In the cases of Oldham[1] and Stillé[2] delivery was effected by podalic version after digital dilatation of the cervix. Robert Barnes in a similar case was enabled to push the pelvic mass upward into the cavity of the abdomen when the cervix was dilated by water-bags, and the delivery of a living child effected by the forceps. The ultimate resource is vaginal hysterotomy, with extraction of the child through the incision.

Incarceration.—When the retroflexion does not terminate in one of the three modes just described, symptoms of incarceration follow. Provided that the original position of the uterus and the pelvic dimensions are normal, it is doubtful, as before remarked, whether any acute cause, such as a fall, is ever sufficient to effect a posterior displacement at a time when the organ is large enough to produce at once symptoms of incarceration. The persistence of complete retroflexion and the occurrence of incarceration must be regarded as exceptional events, while termination in spontaneous rectification, abortion, or partial restitution is the more usual course.

SYMPTOMS, COURSE, AND TERMINATIONS.—In harmony with the usual mode of origin, the symptoms of incarceration are commonly developed gradually, and are preceded by the mechanical disturbances of the functions of the bladder and rectum already mentioned. Sometimes, however, these disorders are relatively slight, and fail to attract the patient's attention, so that the signs of incarceration are apparently developed suddenly.

Probably the first symptom of the condition consists in the so-called ischuria paradoxa, the incontinence of retention. The lumen of the urethra is more or less completely obstructed by the stretching of the canal in the direction of its long axis and the pressure of the cervix against the symphysis. Painful paroxysmal contractions of the distended bladder occur, and a small quantity of urine, sufficient to diminish intravesical tension, is voided. The patient complains of vesical tenesmus and incontinence, while the bladder, full to bursting, is palpable as a tumor above the pubes, varying in size from a child's head to the uterus at term. Defecation is difficult and painful. Later, there is retention not only of scybala, but also of gases, so that tympanites is developed. Vomiting, even of stercoraceous matter, fever, and all the symptoms of ileus make their appearance. Agonizing pain, referred to the sacral, lumbar, and hypogastric regions and radiating along the trunks of the sacral and lumbar plexuses, is constant. At first, it is due to pressure, but later to active inflammatory changes. The mechanical varices and œdema of the vulvar, anal, and perineal regions and the lower extremities become greatly exaggerated, while locomotion is usually rendered impossible.

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[1] *Obstet. Trans.*, vol. i. p. 31.

[2] *Memorabil.*, 1881.

Occasionally, even after incarceration, spontaneous restitution, complete or incomplete, takes place. More frequently, uterine contractions are excited and the ovum is expelled. Abortion under these conditions is apt to be incomplete, and the removal of the remainder of the fœtal envelopes is frequently indicated. In either event, recovery ensues, provided the uterine parenchyma, the bladder, the rectum, and the adjacent pelvic peritoneum and connective tissue have not already sustained irreparable injury. When these natural terminations do not take place, and when aid is not rendered, death is inevitable. A fatal issue, however, is extremely rare; it may result from a variety of causes.

In exceptional cases, under the vesical and rectal tenesmus and the violent involuntary bearing-down efforts, the womb, pressed downward against the pelvic floor, bulges the posterior wall of the vagina forward until the tissues give way and the organ appears at the vulvar orifice,[1] or the anterior wall of the rectum may be inverted and the uterus present through the anus.[2]

But the sequelæ of urinary retention are of most frequent occurrence and of gravest prognostic moment. If retention is effected slowly, the muscular walls of the bladder undergo a considerable hypertrophy. As the intravesical tension increases the walls of the bladder are thinned out and the blood-supply is limited, so that nutritive disturbances in the mucosa take place. At the same time, the urine undergoes ammoniacal decomposition, with the production of cystitis, which soon is transformed into diphtheritic inflammation. Partial or complete rupture of the bladder follows under the constantly increasing tension. The usual course is rupture of the mucosa with urinary infiltration of the muscularis.[1] Gradually, the entire mucous membrane may be detached, and either pass out in shreds through the urethra or remain as a free cast within the bladder. Sometimes, after reposition of the uterus, a partial necrosis of the bladder and its peritoneal covering is observed after a somewhat different mechanism. The organ does not contract and its walls fall together, so that the fundus is partially inverted. Peritoneal adhesions form over the inverted portion, which is subsequently sloughed off. Examples of this condition have been described by Frankenhäuser[2] and Madurowicz.[3] Destruction of part or all of the vesical mucosa, and even of the fundus, however, is not necessarily fatal.[4] Complete rupture, involving the entire vesical wall, is sometimes observed. Acute rupture may follow, though rarely, trauma, as unskilful catheterization (Ahlfeld) or a fall (Martin). Under these conditions the decomposed urine is apt to escape into the abdominal cavity, with rapidly fatal issue. Commonly, adhesions have formed before perforation of the peritoneum, and the urine is encapsulated, ultimately making its exit, when not absorbed, through intestinal fistulæ (Schroeder), or infiltrating the pelvic connective tissue.

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[1] Grenser, *M. f. G.*, Bd. ix. p. 73; Mayer: *Presse Med.*, Bd. i., 1837, p. 153.

[2] Halbertsma: *M. f. G.*, Bd. xxxiv. p. 415.

Retrostasis of urine along the ureters induces, with relative frequency, dilatation of these canals, pyelitis, pyelo-nephritis, hydro-nephrosis, and the like. Urinæmia was the chief cause of death in four cases observed by Robert Barnes.[5] Carl Braun[6] has recorded one case in which death followed eclampsia—symptomatic of urinæmia—and perforation of the bladder.

General peritonitis is of rare occurrence except as a symptom of septicæmia or after perforation of the bladder. The tympanites from obstipation and the pain upon pressure over the distended bladder and incarcerated uterus, as remarked by Spiegelberg, may simulate this condition. Pericystitis, perimetritis, and periproctitis are observed more frequently, although in the case described by Schatz, notwithstanding the duration of the incarceration through one month and the necrosis of the vesical mucosa, no adhesions were present in the pelvic peritoneum. In five fatal cases observed by Robert Barnes no peritonitis was noted. Acute metritis, involving the pelvic connective tissue and perimetrium, may be the starting-point of general septic infection. Septicæmia more commonly results from the resorption of pus from the bladder. Finally, death may occur from exhaustion and ileus.[1]

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[1] Schatz: *Arch. f. Gyn.*, Bd. i. p. 460; Krukenberg: *Ibid.*, Bd. xix. p. 261; Zweifel: *loc. cit.*, p. 307; Kleim: *Inaug. Dissert.*, Berlin, 1880.

[2] *Arch. f. Gyn.*, Bd. xii. p. 352.

[3] *Wien. med. Wochenschr.*, 1877, Nos. 51 and 52.

[4] Schwarz: *Centralb. f. Gyn.*, No. 6, 1880.

[5] *Loc. cit.*, p. 263.

[6] *Loc. cit.*, p. 294.

Diagnosis.—The diagnosis is commonly simple when the fact of pregnancy is established. The distended bladder, behaving as a tumor of the abdominal walls,[2] presents on inspection and palpation characteristic appearances as regards size, form, consistence, and mobility. Fluctuation is distinct unless the intravesical tension is exceptionally great. Zweifel[3] is responsible for the assertion that dribbling of urine in a woman pregnant at the third or fourth month is a certain sign of incarceration. While such a universal proposition is an inaccurate statement, since other morbid states may cause the same phenomenon, still, the symptom always indicates a careful bimanual exploration of the pelvic viscera. In the majority of cases the dribbling of urine will be found to be an example of the incontinence of retention produced by the incarceration of the retroflexed uterus. After catheterization, bimanual exploration reveals the presence of a tumor corresponding in size, form, and consistence to the retroflexed uterus within the pelvic cavity and the absence of such a body in the hypogastric region. Anæsthesia is often necessary to such an examination, on account of meteorism, abdominal and pelvic tenderness. The presence of a tumor corresponding to the uterus within the pelvic cavity, and the absence of such a tumor from the hypogastrium, exclude at once incarcerated fibroids, ovarian cysts, hæmatocele, and hæmatoma. Kidd[4] records a case of intra-uterine polyp which simulated retroflexion of the pregnant womb with incarceration, but the symptomatic menorrhagia was sufficient to differentiate between the two conditions.

Ectopic pregnancy in the cul-de-sac of Douglas resembles in its clinical course the condition under notice. Bailly[5] describes the interesting case of a woman, pregnant three months and a half, with symptoms of urinary retention and obstinate constipation. After the evacuation of the contents of the bladder two tumors were discoverable, one above the pubes, one intrapelvic. The sound introduced into the uterus passed a distance of 8 cm. in the direction of the suprapubic tumor, and the diagnosis of extra-uterine pregnancy posterior to the uterus was made. The supposed retro-uterine tumor gradually disappeared, and the fact of partial retroflexion of the uterus was fully recognized before abortion demonstrated the intra-uterine nature of the pregnancy, or the autopsy the exact anatomical relations. It is highly probable that many of the cases of alleged incarceration[6] and sloughing of the uterine parietes, with the slow discharge of the ovum through fistulous channels into the rectum, vagina, and bladder, are in reality examples of ectopic gestation. The differential diagnosis under these conditions becomes very perplexing. But the history of the case furnishes data of moment. Then in ectopic gestation in the cul-de-sac of Douglas careful observation through a sufficient period of time will disclose the presence of two distinct and more or less separate tumors, the one behind the symphysis possessing the physical characters of the uterus, the other giving the signs of a growing elastic cyst containing bodies of greater resistance. Finally, the skilful use of the sound demonstrates the cavity of the uterus to be empty. While it is sometimes impossible to make a positive diagnosis between the two conditions, an opinion, supported by the weight of probable evidence and sufficient to act upon, may always be formed.

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[1] Hausmann: *M. f. G.*, Bd. xxxi. p. 132.

[2] Schroeder: *loc. cit.*, p. 393.

[3] *Loc. cit.*, p. 306.

[4] *Dublin Journ. Med. Sci.*, Nov., 1875, p. 457.

[5] *Arch. de Tocologie*, 1874, p. 731.

[6] Arthur Farre: *Cyclopædia of Anatomy;* Guichard: *Gaz. méd. de Paris*, 1856.

TREATMENT.—In view of the frequency of abortion and the gravity of incarceration, treatment having for its objective point the spontaneous elevation of the womb is urgently indicated in every case of pregnancy in a retroverted or retroflexed uterus. Prophylaxis under these conditions consists in the regular evacuation of the bladder and rectum, the avoidance of all muscular exertion capable of considerably increasing intra-abdominal tension, and the systematic employment of the genu-pectoral position. As pointed out by Spiegelberg, mild laxatives rather than enemata are indicated, since the tenesmus following the latter is apt to increase the backward displacement. When the uterus shows no tendency to spontaneous elevation before the end of the third month, as already remarked, active interference must be instituted and reduction effected by manipulation, usually aided by anæsthesia. Artificial reposition may be urgently indicated much earlier, notably in cases of threatened or habitual abortion.

In the event of incarceration the first duty of the physician is to direct attention to the bladder and secure its evacuation by catheterization. A flexible instrument of large calibre is preferable even to a metallic male catheter. The introduction of the instrument is often attended with difficulty on account of the long-drawn-out, tortuous course of the displaced urethra, and because the point of occlusion may be high up with a sacciform dilatation below, in which the tip of the catheter becomes lost. The immediate compression of the urethra may be considerably diminished by pressing the cervix backward and away from the symphysis, and by the assumption of the knee-elbow posture. But, as before remarked, the mechanical interference with the flow of urine is conditioned not so much upon compression of the urethra by the cervix as upon the traction of the tube in the direction of its length. The operation with sufficient skill and patience is practicable in almost every case. Veit[1] in a remarkable experience of from 70 to 80 cases was invariably successful.

After the catheter has entered the bladder its aperture may be occluded by a bit of necrotic mucous membrane or a blood-clot. A stream of tepid water injected through the instrument will dislodge the fragment. Inasmuch as the vesical walls are frequently in a semi-paralytic state, it is well to draw off the urine gradually or at intervals, to permit the musculature to accommodate itself to the lessened tension. In the rarely exceptional cases in which catheterization is impracticable an attempt at reposition of the uterus may be made without the evacuation of the bladder. Failing in this manœuvre, aspiration is the only resource. The point of puncture should be in the median line about 8 cm. above the pubes, so that it may remain coincident with the perforation of the bladder and still be above the occlusion (Spiegelberg). Following the evacuation of the bladder E. Martin[2] observed the occurrence of spontaneous reposition in 4 out of 16 cases; in 11 replacement was effected in the genu-pectoral posture.

The second indication is the reposition of the uterus. To accomplish this purpose there is a variety of methods, manual and instrumental. Taxis per rectum or per vaginam, or both, in the knee-chest position, is the mode of election when the tenderness is not so great as to require at once anæsthesia. In the latter event the lithotomy posture is substituted. Two fingers, or even the half hand if small, may be introduced into the lower portion of the rectum, and pressure applied to the fundus, not immediately upward, but in the direction of one or other of the sacro-iliac joints, while the fingers of the other hand seek to bring the cervix downward and backward. The insertion of traction-forceps in the vaginal portion to effect the latter object is of doubtful propriety under all conditions, and is very seldom really necessary. Little by little, under patient, persistent, but gentle manipulation at one or more sittings, elevation of the fundus is secured unless the obstacle to replacement is absolutely insurmountable. Reposition is complete only when the fundus falls forward above the plane of the inlet and the vaginal portion is found near the hollow of the sacrum. After reduction a return of the former condition is prevented by rest in bed in the latero-prone position until the uterus is of sufficient size to maintain its position within the abdominal cavity.

The various instrumental methods employed from time to time with varying degrees of success possess at the present a largely historical interest, since taxis is capable of accomplishing more in a shorter period of time with less trauma. Playfair succeeded in the reduction of the displacement in two cases within twenty-four hours by the use of the continuous elastic pressure furnished by a pyriform india-rubber bag distended with water. Robert Barnes recommends the introduction into the rectum of his hydrostatic dilator. Levers of various forms—the spatula-lever of Antoine Petit, a single blade of the obstetrical forceps, the vectis—have been inserted into the rectum with the object of aiding the ascent of the uterus by the provision of an inclined plane.

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[1] *Volkmann's Sammlung klin. Vortr.*, No. 170, p. 1363.

[2] *Zeitschr. f. Geb. und Frauenkrank.*, Bd. i. p. 1.

It is necessary to recognize the fact that the retroflexion may be irreplaceable, and never to force reduction. The uterus may be immobilized by adhesions in the fossa of Douglas, or covered with the exudates of former pelviperitonitides, or retained by inflammatory swelling of the parts contained in the pelvis. Undue violence may rupture these adhesions or inflict fatal injury upon the uterus.[1]

When efforts at reposition have failed to release the uterus, the immediate induction of abortion is indicated. But this operation is commonly difficult, on account of the position of the cervix. However, the chief objection to the insertion of forceps in the vaginal portion is now removed, and the mouth of the uterus may frequently be exposed and rendered accessible by traction downward with a tenaculum. When practicable, a flexible bougie should be introduced between the chorion and decidua and permitted to remain. P. Müller[2] has suggested and practised, in a single case, the ingenious device of introducing the cut-off end of a male catheter, bent into a hook, through the cervical canal. A piece of catgut was then passed through this canula between the membranes and the uterine walls. Abortion occurred within twelve hours. The objection, only a relative one, to puncture of the membranes over the internal os is the danger of incomplete abortion.

When for any reason the induction of abortion after the modes just described is not possible, puncture of the uterus and aspiration of the ovum must be tried. The point of puncture should be the most prominent portion of the corpus as felt per vaginam. The objection to puncture of the fundus per rectum consists in the exposure to septic infection. Under antiseptic precautions, and when the needle passes perpendicular to the uterine wall, the danger from this operation is minimal. The puncture is soon closed by uterine contractions after the evacuation of the liquor amnii. Abortion, however, is apt to be incomplete. After the diminution in volume of the uterus by the induction of abortion, reposition is usually practicable, when the uterine cavity may be completely emptied and disinfected.

Until within a very recent period the artificial induction of abortion has been the *dernier ressort* in the class of cases now under consideration. A few months since Olshausen[1] successfully extirpated the retroflexed uterus, pregnant in the third month, after failure in reposition and the induction of abortion, in a case of osteomalacic pelvis. Aspiration of the ovum through the vagina with Potain's apparatus, after two trials, having proved of no avail in the excitation of uterine contractions, and symptoms of peritonitis beginning upon the third day afterward, two expedients were considered—vaginal section of the uterus with enucleation of the ovum, and total extirpation per vaginam. This case is the first recorded example of total extirpation of the pregnant uterus per vaginam for any cause other than carcinoma. No doubt can exist as to the adequacy of the indication. The operation itself was technically easy. As pointed out by Hofmeier, Benckiser, and others, the softening and relaxation of the uterine ligaments incident to pregnancy greatly facilitate manipulation.

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[1] Schatz, Moldenhauer, Blundell: *Arch. f. Gyn.*, Bd. vi.

[2] *Beitr. zur. Geburts.*, Bd. iii. p. 67.

PROLAPSE.

Prolapse of the pregnant uterus presupposes, in the large majority of examples, conception in an organ that has already suffered this displacement.[2] In certain cases the sperma is injected directly into the uterine cavity. Acute prolapse is seldom observed, but may occur during the early months of pregnancy from the same causes which produce the displacement in the non-gravid organ—sudden elevation of intra-abdominal pressure, especially when the bladder is full, as in jumping, falling, and the like.

All degrees of the displacement have been seen and recorded. However, no authentic case of pregnancy in complete procidentia persisting until term is recorded in the literature of the subject. In Wimmer's[3] remarkable case the patient died at the end of the sixth month, when the fundus was found below the plane of the outlet. Many cases of alleged complete and incomplete prolapse are in reality examples of hypertrophy of the supra- or intravaginal portions of the cervix, with or without descent of the uterus.[4]

The COURSE and TERMINATIONS of the condition under notice closely resemble the natural history of retroversion. In simple prolapse, without version, spontaneous elevation commonly takes place, just as it does after the physiological descent of the uterus during the first two months. Only a slight prolapse of the vaginal walls remains to mark the former displacement. Abortion during the early months is less frequent than in retroversion; usually it follows acute prolapse, on account of the rapid circulatory disturbances, hemorrhage into the membranes, and death of the fœtus. When spontaneous elevation does not occur, incarceration follows. Commonly, however, in these cases there is also some degree of backward displacement. In very rare cases the organ in its further development descends below the plane of the outlet, when abortion often follows. In other cases, if spontaneous or artificial reduction is not effected, the termination is in death.

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[1] A. Benckiser: "Totalexstirpation des im dritten Monat graviden retroflektirten Uterus wegen Unmöglichkeit der Reposition bei osteomalacischem Becken; Heilung," *Centralb. f. Gyn.*, No. 51, 1887, p. 824.

[2] Spancken: *Arch. f. Gyn.*, Bd. xvii. p. 128.

[3] Tarnier: *loc. cit.*, p. 218.

[4] *Zeitschr. f. Geb. u. Gyn.*, Bd. ii. p. 240.

In the DIAGNOSIS it is necessary to differentiate sharply between simple prolapse and hypertrophic elongation of the cervix with or without descent of the uterus.

The suggestions already made in connection with the treatment of backward displacements apply with equal force to the condition under notice, necessary changes being made for the slight difference in direction of the displacement. Care must be taken in the use of hard-rubber pessaries for the purpose of retention. In many cases the presence of a foreign body of this nature in contact with the lower uterine segment is sufficient to determine expulsive contractions of the uterus. Rest, posture, and the cotton-wool tampon are safer means, and, as a rule, are perfectly efficient.

In extensive hypertrophy of the cervix amputation during pregnancy is indicated on account of the grave disturbances that are almost certain to arise during labor. There is, of course, under these conditions, some risk of abortion, but this accident is of insignificant moment compared with the serious obstacle opposed to dilatation in the long, thickened, indurated cervix.

Incomplete prolapse of the vagina, commonly affecting the anterior wall and causing vesical and vulvar irritation, indicate the use of astringent lotions and the cotton tampon saturated with glycerin and tannic acid. During labor the presenting part may force the prolapsed and hypertrophied vaginal walls through the vulvar orifice. The tumors thus formed, of variable size, sometimes constitute an obstacle to the advance of the child, or pressure-necrosis of the vaginal wall itself may follow. In the intervals between pains the tissue can be slipped over the presenting part, and during pains it may be held in position until the obstacle is passed. In other cases the timely application of the forceps fulfils the indication.

HERNIÆ.

Herniæ of the pregnant uterus are very rare phenomena. Examples of the umbilical, inguinal, and femoral forms of the anomaly have been recorded.

In the later months the uterus may protrude through the umbilical ring into the sac of an old omphalocele. Murray[1] describes a case of this kind in which two-thirds of the uterus were thus situated. Olliver[1] reports a case in which the placenta was retained within the protruding uterus. In these, as also in a case recorded by Léotand,[2] spontaneous delivery took place. Abdominal herniæ in consequence of diastasis of the recti and the yielding of cicatrices following abdominal section or injury have already been mentioned.

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[1] *Med. Times*, April, 1859, p. 406.

According to Eisenhart,[3] the first case of inguinal hernia of the gravid uterus was described by Nicolaus Pol in 1531; after Cæsarean section the mother lived three days, the child one and a half years. The second case, reported by Sennert, was subjected to Cæsarean section April, 1610, by Jer. Trautmann. The mother survived the operation twenty-five days, the child lived to be nine years old. Other cases have been reported by Saxtorph, Ledesma (1840), Rektorzik (1860), Scanzoni (1869).

Winckel has recently described a case of inguinal hernia of the pregnant right horn of a uterus bicornis. During the fifth month this horn was amputated and a dead fœtus removed. The patient recovered.

Almost always the hernia has been in existence prior to conception; in certain cases, however, the condition is observed only during pregnancy. Three distinct modes of origin may be recognized: (1) adhesions between the uterus and the intestine, which draw the former into the sac; (2) an ovarian hernia, which the uterus follows; (3) congenital hernia of the uterus.[4]

Femoral and inguinal herniæ of the gravid womb are readily recognized by the absence of the uterus from its usual position, the direction and shape of the vaginal portion and vagina, and the physical characters of the suspected tumor.

Reduction of these herniæ is usually impossible, on account of the adhesions or the volume of the uterus. Failing to replace the uterus, the induction of abortion is indicated. When the fœtus is viable Cæsarean section should be performed. Spiegelberg suggests incision of the neck of the sac and an attempt at reduction before Cæsarean section is performed. Schultze recommends Porro's operation. The latter expedient prevents a recurrence of the accident, and was entirely successful in Winckel's case.

ANOMALIES OF THE VAGINA.

Vaginal Leucorrhœa.—Normally, the vaginal secretions are augmented during pregnancy at the same time with the hypertrophic changes in the mucous membrane, so that it is not uncommon to observe a condition in the perfectly healthy pregnant woman which in the non-gravid state would constitute a catarrhal vaginitis. Particularly during the second half of pregnancy a noteworthy papillary hypertrophy may occur. The examining finger detects little elevations, the size of a hempseed, disseminated over the entire surface. This condition was described by Deville in 1844 under the term "vaginitis granulosa," and was erroneously believed to be peculiar to pregnancy. The term applied by Deville is a misnomer, inasmuch as the condition is not an inflammation, but essentially a physiological hypertrophy of the papillæ of the mucous membrane.

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[1] *Western Journ. of Med.*, 1867.

[2] *Gaz. des Hôpit.*, 1859, No. 105.

[3] *Arch. f. Gyn.*, Bd. xxvi. Hft. 3, p. 439.

[4] Klob: *Path. An. d. Weibl. Sexualorgane*, Wien, 1864.

Often enough, vaginal leucorrhœa during pregnancy is of gonorrhœal origin. Then it is sometimes extraordinarily difficult to distinguish between the papillary hypertrophy just mentioned and the pointed condylomata of suspected gonorrhœa. In the latter disease, however, the discharge is apt to be more profuse, more distinctly purulent, and more irritating, while the vulvo-vaginal glands and urethra are apt to be involved. Finally, it is sometimes possible to detect the gonococcus of Neisser. Increased vaginal discharges may also be due to endocervicitis—a condition fully considered under Inflammation of the Endometrium during Pregnancy.

The slighter forms of vaginal leucorrhœa during pregnancy occasionally demand treatment on account of excoriations and itching about the vulvar orifice. Vaginal irrigation with tepid water, variously impregnated with alum, zinc sulphate, borax, carbolic acid, and the like, usually relieves the distressing symptoms. In more obstinate cases lotions containing corrosive sublimate in dilute solution are of undoubted value. A great degree of caution in the use of the cotton tampon is always necessary during pregnancy, on account of the reflex influence upon uterine contractions.

When gonorrhœal infection is at all probable, more energetic local treatment must be at once instituted, to prevent ophthalmia neonatorum as well as to ensure a normal puerperium. A 2 per cent. solution of argentic nitrate, thoroughly applied to every fold of mucous membrane by means of Braun's hard-rubber speculum, is a very efficient means. Corrosive sublimate is also of value under these conditions.

Winckel[1] has described under the term "colpohyperplasia cystica" a condition of the vaginal mucous membrane during pregnancy characterized by enormous quantities of small superficial cysts filled with gas, developed upon succulent hyperæmic bases and accompanied by hypersecretion.[2] Great diversity of opinion exists as to the exact pathological significance of this condition. Thus, Ruge terms the condition "kolpitis vesiculosa emphysematosa," and locates the little air-filled cysts in the spaces of the submucous connective tissue. Chiari, Spiegelberg, and others find the cysts in the lymph-spaces and in ectasiæ of the lymphatics. Zweifel, discovering trimethylamin in two cases, suggested the hypothesis that the gas was developed in the glands after the obliteration of their excretory ducts as the result of the penetration of certain germs. Häckel, V. Preuschen, and others have recently observed glandular epithelium in the cyst-wall, which would tend to confirm Zweifel's view. Aside from the pathological point of view, the condition, as remarked by Lebedeff, is of little practical interest. It commonly disappears during the puerperium, and seldom or never indicates special treatment.

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[1] *Arch. f. Gyn.*, Bd. ii. p. 383.

[2] Schroeder: *Archiv f. klin Med.*, xiii. p. 538.

Occasionally, catarrhal vaginitis during pregnancy is complicated by mycosis. White or grayish firmly-seated plaques upon red bases are observed about the nymphæ and introitus vaginæ. The two fungi most frequently noted are the Leptothrix vaginalis (Hausmann) and Oïdium albicans (Robin). While the former mycosis is ordinarily unattended by symptoms, itching, burning sensations of heat, and increased secretion are the common sequelæ of the latter. The infusorium Trichomonas vaginalis, so often found in the secretions of the part, is devoid of clinical import.

The treatment consists of vaginal irrigation with dilute solutions of carbolic acid (2 per cent.) or of corrosive sublimate (1 : 2000).

Vegetations of the Vulva are sometimes an annoying complication of pregnancy and labor. Acuminate condyloma is the result of the irritant action of gonorrhœal secretions upon the mucous membrane and skin in the majority of cases. But it is highly probable the condition may arise, in the absence of specific infection, from irritation by profuse catarrhal secretion and attrition of the opposed surfaces. Direct contact infection through the pointed wart itself during coitus has not been demonstrated. Duhring is responsible for the assertion that the pointed wart is "never a manifestation of constitutional syphilis."

During gestation the pointed wart grows with remarkable rapidity, not infrequently attaining a size sufficient seriously to complicate labor—seldom, indeed, as a mechanical obstacle to the advance of the child, but as a hindrance to dilatation of the perineum and as a cause of hemorrhage. The disease sometimes offers an obstinate resistance to treatment during pregnancy, but frequently disappears spontaneously during the puerperium. On account of the ease with which gestation may be interrupted, operative interference is contraindicated. The warts should be treated by washing with liquor sodæ chlorinatæ, afterward dusting with calomel, and isolation by means of absorbent cotton.

Allusion has already been made to the troublesome symptom of *pruritus vulvæ* during pregnancy. It is of importance not to mistake this disorder for other morbid states of which itching is a prominent symptom, and which are apt to make their appearance in this region.

Persistent itching about the genitalia should always lead to a careful local examination. In the majority of cases, as remarked by Duhring, the "diagnosis will in all probability be one of three diseases—eczema, pruritus, or phtheiriasis pubis." Pruritus is a functional disease of sensation of reflex origin, without structural alteration of the skin. The disease is of rare occurrence, although itching about the genitalia from the causes mentioned is frequently observed.

The treatment consists in the elimination of the cause as far as this is possible. When dependent upon the physiological changes in the genitalia, of course the therapy must be merely palliative. Under these conditions local treatment is of paramount importance. Local anæsthesia by means of cocaine is the most important measure. Goodell recommends injections of the decoction of tobacco. Bulkley extols the following ointment as efficient in many cases: ℞. Camphoræ, Chloratis hydratis, *āā.* ʒj; Ungt. aquæ rosæ, ℥j. M. The camphor and chloral should be rubbed together until fluid before the addition of the ointment. Carbolic acid, aconite, and the preparations of opium are also of decided value.

THE PHYSIOLOGICAL AND CLINICAL PHENOMENA OF NATURAL LABOR.

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Definition.—The variations in the mental, emotional, physical, and social characteristics and the circumstances of life of childbearing women are so multiform that it is impossible to define normal labor by the sharp lines of uniformity. It cannot be asserted that any two cases are identical, yet there is sufficient constancy in the course, progress, and termination of labor to establish a type which is recognized as normal in the physiological aspects of clinical history.

Labor is a natural process necessarily attended with more or less violence, and the physiological cannot always be distinguished from the morbid phenomena. It involves exertion which is associated with more or less suffering. These circumstances disturb, to a greater or less degree, the ordinary functional activities of the animal economy, so that even such apparently trivial conditions as unusual duration or precipitous progress may quickly transform an otherwise perfectly natural process into one of the gravest import.

Normal labor is ordinarily defined to be one that is effected by the natural effort of the female organism without artificial assistance, either manual, instrumental, or otherwise. But this definition must not be too sharply drawn; for the variations in duration, extent of traumatism, intensity and effect of the parturient effort and power are so numerous, and so easily influenced by diverse and intercurrent conditions of the woman, that it is far safer to regard every parturient woman as a sick woman exposed to dangers and complications which may imperil her safety.

Normal labor is the physiological termination of pregnancy, and is coincident with the maturity of the fœtus. To be natural there must exist such adaptability of the size, position, and presentation of the fœtus to the form and size of the birth-canal as will permit its passage to be effected by the voluntary and involuntary forces of parturition.

CAUSES OF LABOR.—The causes of labor are classified as determining and efficient.

The determining causes refer to conditions supposed to excite the expulsive efforts, and thus determine the beginning of actual labor. Very many theories have been advanced, but as yet none have been accepted as sufficiently plausible or scientific to adequately explain the termination of pregnancy and beginning of natural labor with such uniformity when the fœtus has reached maturity. Some have claimed the active agency of the fœtus in exciting uterine contractions, whilst others have maintained its absolute passiveness. Other investigators have ascribed the initial cause to fatty degeneration of the decidua; completion of the development of the muscular fibres of the uterus; reaction of the muscular structure against distension; accumulation of carbonic acid in the uterine sinuses; gradual expansion and obliteration of the cervical canal, and consequent pressure of the ovum upon the os uteri; and ovarian excitement, irritability of the uterus, and reflex influences. For a time the theory of uterine peristalsis, first advanced by Power, was accepted by many as satisfactory.

The motor impulses are derived from the sympathetic system and medulla oblongata. Hence it is entirely consistent with physiological law to infer that active uterine contractions may be induced by a variety of influences having their origin either in disturbances of the sympathetic system or in the motor centres in the medulla and cord.

The consensus of opinion in regard to the fallacy of some and weakness of all the suggested theories of causation predicates the conclusion that the initial cause must be sought in some combination of the conditions of utero-gestation, which, like the fœtus, have reached a stage of development and maturity when the activities are intensified or concentrated or a new force is evolved. Lusk offers the grouping of these conditions in the order of their relative frequency as a possible explanation. With the progress of pregnancy the irritability of the uterus is increased and the firmness of the attachment of the decidua is diminished. As labor approaches, the uterus more quickly responds to reflex stimuli, local irritation, and accumulation of carbonic acid in the blood. The tension of the uterine walls is continuously increased and the reaction of the muscular structure is intensified. The circulation is more easily disturbed and emotional sensibilities are more readily excited. Probable physiological separation of the decidua, resulting from repeated insensible contractions of the uterus, may partially convert the ovum into a foreign body, thus creating an active agency. The maturity of these preparatory changes and processes is coincident with the advent of labor.

Efficient Causes of Labor.—The contractions of the uterus constitute the essential, and are often the only, force employed in the expulsion of the fœtus. When the dilatation of the os uteri is complete, and the second stage of labor has begun, the propulsion of the fœtus is promoted by the action of the abdominal muscles. These conjoined forces may oftentimes be increased and prolonged by the well-directed bearing-down efforts of the parturient. When delivery is accomplished during narcotism, the uterine contractions are unaided by the voluntary contractions of the abdominal muscles, but it does not necessarily follow that the duration of the labor is prolonged. In some cases, especially in primigravidæ, anæsthesia eliminates disturbing influences and intensifies the contractions of the uterus. In such cases labor is expedited.

Precursory Symptoms of Labor.—These are variable and inconstant, and rarely of special significance. In many cases labor begins abruptly with strong uterine contractions. Sometimes the patient is awakened from a profound sleep either by a sharp pain or the escape of the amniotic fluid, and labor progresses rapidly to a satisfactory termination. Perhaps in a majority of cases labor is preceded by some change in the contour of the abdomen, but it is not always sufficiently marked to be observed even by the patient. In the primiparæ with roomy pelves the descent of the uterine tumor is most observable because of the entrance of the lower segment of the uterus into the pelvic cavity, and is most marked by the diminished tension of the abdominal walls, lessened pressure against the diaphragm and upon the stomach, and, perhaps, by the consequent increased frequency of micturition, greater swelling of the lower extremities, and greater inconvenience in walking. Some women during a few days, and others during a longer period, immediately preceding the advent of labor are more or less annoyed with what are commonly called "false pains." They usually, more especially in multiparæ, occur during the earlier hours of the night, disturb the rest, and disappear to recur the succeeding and perhaps for several nights, and then may cease entirely. They are irregular in time, duration, and degree, and are unassociated with dilatation of the os uteri or show of blood. With obliteration of the cervix, regularly-recurring pains, and dilatation of the os, labor has begun.

The most constant precursory signs are increased secretions from the cervical and vaginal glands and swelling of the labia. These secretions vary greatly in quantity in different women. In obese women they are more abundant, and in some are more or less acrid. The viscid and yellowish discharge from the glands of the cervix is occasionally stained with blood. The vaginal secretion is mainly dependent upon the pressure of the gravid womb and consequent congestion of the soft parts.

The Stages of Labor.—The period of labor is divided into three stages—first, second, and third. The first is the stage of dilatation of the os uteri; the second is the stage of expulsion, and comprises the period from the complete dilatation of the os uteri to the extrusion of the fœtus; and the third is the stage of placental detachment and delivery and contraction of the uterus. Ordinarily, the description of the third stage is limited to the delivery of the placenta, because, fortunately in most cases, the contraction of the uterus progresses with its detachment, and is completed with its extrusion through the os; but for reasons too apparent to require recital here it should not be considered as terminated until firm and persistent contraction of the uterus is established and secured.

THE PHENOMENA OF LABOR.—The phenomena of labor are divided into the physiological, mechanical, and plastic. The consideration of the physiological phenomena must necessarily precede the description of the clinical history of the several stages of labor. The mechanical phenomena will be discussed in the article on the Mechanism of Labor.

The Contractions of the Uterus.—These contractions are entirely independent of the will, yet they are frequently influenced by mental and other intercurrent conditions. Any sudden surprise, a disagreeable communication, or the unexpected entrance of a person into the chamber may suspend or lessen, for a time, their power. The first visit of the accoucheur will very often arrest them. In the beginning they are slow, weak, short, and at long intervals, especially so in primiparæ. Sometimes they will cease for a shorter or longer time, to return with increased violence and duration. Each contraction begins and gradually increases to its maximum intensity, and then gradually subsides to complete quiescence. As the labor progresses they increase in frequency, duration, and power.

Intermittence is a special and important characteristic. In the earlier period they may not continue longer than twenty seconds; in the later, as long as one minute or more. During the intermission the muscular structure of the uterus relaxes and the organ resumes its ovoid contour. As they increase in intensity the intermission is shortened, but they never become continuous, except perhaps when the head is about to escape the vulvar orifice, when the duration is greatly prolonged. followed by sudden cessation with the passage of the head, and a longer pause.

Intermittence is a wise provision of nature. It enables the patient to regain strength, recuperates vigor, and prevents demoralization. Respiration, though increased in frequency, is fuller and freer than during the contraction, and the disturbed circulation is equalized. During the pain the pulse is increased in frequency, arterial tension is increased, the face is suffused, respiration is interrupted, the lungs are in a state of partial or complete expansion, the diaphragm is depressed, and the general muscular system is maintained in the condition of tonic rigidity. During the intermission respiration is restored, the color of the face disappears or lessens, the pulse slows, arterial tension diminishes, and there is relaxation of the muscular system. Continuous contraction would inevitably lead rapidly to disastrous consequences. No woman could survive such a condition during an ordinary labor, or even for any considerable time, without artificial interference; and no womb could resist rupture. Intermittence promotes the advance of labor; tonic contraction arrests progress. It is also a conservator of the life of the child. Persistent contraction produces continuous pressure upon the child, which would cause asphyxia and death.

Some maintain that the contractions are peristaltic, beginning either in the fundus or neck and extending toward the opposite pole. Others insist that the uterus contracts simultaneously in all of its parts. If the wave of persistalsis exists, it extends from pole to pole with marvellous rapidity.

The force of the contraction increases with the progress of labor. The greater the power, the shorter the intermission. With increased resistance the intensity of suffering and force of the contraction are augmented. Beginning with barely perceptible pain, the suffering continuously intensifies until the maximum degree of agony is reached just at the moment when the parietal eminences pass the vulvar orifice, followed by abrupt cessation of the indescribable anguish, with joyful exclamations of relief.

In vertex presentations the contractions of the uterus are more regular and effective. The uniform expansion of the lower segment of the uterus and pressure upon the dilating os evolve force and promote regularity of action. They are also more effective because of the more complete adaptation of the diameters of the head to those of the birth-canal. The uniformity of pressure and action excites the contractions of the abdominal muscles and enhances the value of this accessory force.

The Action of the Contractions upon the Walls of the Uterus.—During the contractions the form of the uterus is changed from an ovoid to a globular shape. The transverse diameter is diminished, whilst the longitudinal and antero-posterior are increased. This change in the form of the uterus extends the fœtus. The continuously increasing thinness of the lower segment of the uterine walls permits increasing downward stretching, and with diminution of the bulk of the organ there is increased thickness of the walls of the body and fundus. These changes in form and size push the uterus forward against the abdominal walls.

The Accessory Forces.—The contractions of the abdominal muscles are the most important of these auxiliary forces. During the first stage of labor, while the dilatation of the cervix and os is in progress, the contractile movements of the abdominal muscles are barely appreciable either to the patient or observer; but with the onset of the second stage, and during the progress of the expulsive period, they are greatly increased in power, and contribute effective assistance to the expellent uterine contractions by fixing the organ in position and firmly pressing it downward in the direction of the axis of the superior strait of the pelvis. During the stage of dilatation they are, probably, wholly independent of the will, but during the second stage they are in a marked degree controlled in effectiveness, if not in evolution, by the volition and conduct of the patient. When the concluding moments of the expulsive period have arrived, and the alternate recessions of the advancing head have ceased, they assume a distinct reflex character, and constitute the predominant factor in maintaining the continuity of effect and effort during the passage of the head through the vulvar orifice. The influence and control of the patient are exhibited in the voluntary fixation and position of the body and limbs, full inspiration, suppression of outcry, pressure of the feet against some fixed support, and grasp of the hands of attendants or any object within reach preparatory to the evolution of the contributing bearing-down effort. The involuntary closure of the glottis, depression of the diaphragm, and general tonic muscular rigidity are unavoidable accompaniments of appreciable utility.

The conduct and position of the patient are not without value as aids in expediting and making effective the voluntary and involuntary forces of labor. The woman who tosses about the bed screaming with the utmost vehemence, or lies in rigid extension during the pains, wastes force and time and invites exhaustion, usually taxes the patience and endurance of the accoucheur to its utmost tension, and hastens the employment of instruments. Englemann has demonstrated the value of position in natural labors, but change of posture may often be utilized as a coefficient in accelerating delivery. As a rule, the left lateral position, with the thighs flexed upon the trunk and legs upon the thighs, is preferable, because more convenient for the ordinary manipulations and observations, and bringing the direction of the involuntary and accessory forces into more direct parallelism with the utero-pelvic axis through which descent of the head and delivery of the child must be accomplished.

The round and broad ligaments contain muscular fibres continuous with the muscular structure of the external layer of the uterine walls, and are simultaneously engaged in the contractions of the organ. The action of these supports is to fix and depress the uterus, holding it firmly in position with the fundus forward against the abdominal walls and the lower segment in the pelvic brim.

The expellent forces originate and consummate the process and progress of natural labor. It is true that in the beginning propulsion does not markedly characterize uterine contraction, but labor is an entirety, comprehending the successive stages of preparation, progress, and completion. Each force is the adjuvant of the others, and each finds its corollary in the anatomical relations and structural conditions of the parts concerned. The uterus is a hollow muscular organ, with a single expansile outlet at its most dependent part, and with walls of varying thickness and elastic and contractile properties. It is filled to repletion with a solid body floating in a liquid contained in a closed sac attached to its inner surface. If its contraction were uniform and equal in force throughout, compression of its contents would be the only result. But as the lower segment terminates in a dilatable orifice, is thinner, more expansible and elastic than the fundus and body, the force of compression is necessarily expended upon it. The expansile outlet yields with each successive contraction, and the presenting head descends toward the yielding and bulging inferior segment. The concentric pressure of the uterus is exerted mainly, if not solely, upon the peripheral liquid contents of the amniotic sac; and that portion of the fluid occupying the thinned, elastic, and distended segment is imprisoned by the close coaptation of the descending head with the uterine walls; consequently, increased tension and protrusion of the sac at the point where the resistance is removed. With the continuously increasing tension of the lower segment during the successive contractions, and simultaneous thickening and retraction of the walls of the body and fundus, and lessening of the organ in all of its diameters during the process of extrusion of the fœtus, detachment of the placenta and secundines takes place.

The uterus also possesses the inherent property of retraction. This is due to the continuous change in the muscular fibres of the upper segment which takes place during labor. In the lower segment the fibres are stretched and lengthened; in the upper they are shortened and the walls thickened. As the gradual retraction, with thickening and condensation of the walls, proceeds, the stretching and tension of the lower segment increase, thus, in some measure, promoting the dilatation of the cervix and os. The ridge of Bandl, the existence of which is disputed, is supposed to define the limit between the upper and lower zones. The positive pròperty of retraction resides in that portion above this alleged ridge, and the indirect effect upon the cervical canal is due to the insertion of some of the longitudinal muscular fibres of the lower segment in the cervix, which are subjected to increased tension because of the continuously increasing and partially permanent stretching of the walls of the lower zone.

Force of Uterine Contractions.—Various attempts have been made to measure the force of uterine contractions, but none have proven satisfactory. Poppel estimated the force exerted in easy labors at from 4 to 19 pounds; Duncan, at from 6 to 27 pounds. Duncan concludes that in a majority of labors the propelling force does not exceed 40 pounds. Poullet estimates the maximum force of expulsion at 50 pounds. Schatz's investigations led him to the conclusion that the force varied from 17 to 55 pounds. The conclusions of Poppel and Duncan point to the fact that in many easy labors the force does not exceed the weight of the fœtus. The force employed is necessarily dependent upon the amount of resistance, which is influenced by a variety of conditions referable either to the child or mother.

Pain.—With rare exceptions, childbirth is attended with more or less pain from its beginning to its termination. Some women fret, toss, and scream with every uterine contraction; others will bear the most intense agony in quiet and without complaint. Some feel pain more acutely than others, and exhibit suffering in such intensity as to invoke the most profound sympathy and commiseration. Primiparæ suffer more than multiparæ. The pains are synchronous with uterine contractions, and "labor-pains" is the ordinary expression indicating such action of the uterus; but the suffering does not actually begin with the commencement of the contraction, and terminates before it has subsided. In other words, the duration of actual and manifest pain is less than that of the contraction.

During the earlier period of dilatation of the cervical canal the pains are very slight, barely manifest to an observer. The patient may for a moment suspend conversation or any employment in which she may be engaged, and perhaps there may be some trivial change of expression and posture. If sitting she may lean forward, or if standing stoop slightly. Such temporary interruption will be followed by resumption of conversation or employment and apparent perfect self-possession. The painful periods increase in duration, frequency, and intensity. During the stage of dilatation they are described as worrying, cutting, teasing, or grinding, at first felt in the lumbar and sacral regions, then radiating toward the pubes, encircling the body, and finally passing, by a gradual transition, into bearing-down expulsive efforts, with markedly increased suffering during the progress of labor. At first the pains are actually located in the lower segment, but during the second stage they invade the body and fundus and are distinctly felt in the uterine tumor. The ordeal of suffering is soon forgotten after the labor is over, and many approach a second confinement with less trepidation, but in others the fear is greatly increased. The manifestations of suffering are more influenced by mental and emotional than by physical conditions. Delicate and feeble women often pass through the travail of labor with composure and heroism, whilst the robust and healthy often exhibit their suffering in the most exaggerated manner.

False Pains.—Sometimes, near the approach of labor, pregnant women are seized with pains which may be mistaken for labor-pains. Such seizures are known as "false pains," and are to be distinguished from the pains of labor by their situation, usually in some part of the abdomen, their irregularity in time and degree, their disassociation with dilatation of the os, and the absence of any "show."

Dilatation of the Cervix and Os.—Labor begins with painful contractions of the uterus, and with these contractions commences the process of dilatation of the cervix and os. The pains are usually very slight in the beginning, but gradually increase in frequency, duration, and intensity. The woman is not confined to the bed, but most often is sitting up, and during the intervals walking about her chamber. With the onset of the contraction she quickly returns to the chair, bends forward, with her hands pressing upon her hips or sacrum or upon her knees, or leans forward, resting herself upon the back of a chair. With the subsidence of the pain she resumes the cheerfulness and complacency of freedom from discomfort, and not infrequently engages in pleasant conversation with those present. The intervals of relief and periods of suffering recur in quick succession. With each recurring contraction the process of dilatation progresses: beginning at the internal os, it gradually encroaches upon the cavity of the cervix until the pressure reaches the external os, which slowly increases in diameter, with thinning of the lips and the formation and protrusion of the bag of waters. As a rule, when the dilatation is complete, perhaps reaching three or three and a half inches in diameter, spontaneous rupture of the amniotic sac takes place, with a copious discharge of fluid; then follows the second stage of labor. As the process of dilatation of the external os increases, the secretion is stained more or less with blood, most often due to slight lacerations of the os, but this may, when freer, be caused by a serious laceration of the cervix or a partial detachment of the lower segment of the placenta when its implantation invades or encroaches upon the cervical zone. The end of the first stage cannot always be accurately defined. There is usually a short pause between the conclusion of the first and the beginning of the second; but very often the transition is so gradual that the precise moment of the commencement of the second stage cannot be fixed.

The Bag of Waters.—The formation of the bag of waters occurs during the first stage, and is one of the most constant physiological phenomena of the process of dilatation. When the rupture of the membranes occurs previous to or at the onset of labor, a partial discharge of the amniotic fluid takes place. Such cases are known as dry labors, and are slower in their progress than when the sac remains intact until dilatation is completed. As the dilatation of the os increases the resistance is diminished, and with each succeeding contraction of the uterus the quantity of amniotic fluid in the dependent part of the sac is increased and imprisoned by the pressure and ball-valve action of the presenting part of the fœtus. In consequence of the continuous lessening, and the final removal, of the resistance by the expansion of the os, a portion of the sac protrudes, forming a more or less hemispherical bag, which by its continuously increasing size and length promotes dilatation of the os and, but to a much lesser degree, of the vagina. The size and form of the bag of waters are dependent upon the condition of the os, the amount of the liquor amnii, the tensile strength of the membranes, the power of uterine contractions, and the presenting part of the fœtus. In head and breech presentations the membranous bag is more or less hemispherical, and more or less regular in contour, according to the presence and extent of the lacerations of the cervix and shape of the os. In breech cases the bag is usually less tense, but more voluminous, than in head presentations, because of the imperfect closure of the lower uterine segment; and when the os is rigid it may be elongated. In cases of the extension of an extremity, with persistence of the membranes, there would be an elongation of the pouch, and the shape of the most dependent part might indicate the presence of a hand or foot. Madame Lachapelle declared she was never anxious when "the flat sac" was present, thereby meaning, says Cazeaux, that any "very great protrusion of it nearly always announces an unfavorable position" of the fœtus.

Spontaneous rupture of the membranes usually takes place in the part protruding through the os, most frequently at or about the most dependent point or apex of the bag of waters, because at this point the pressure-force of the compressed liquid is greatest and the resistance least. Too early evacuation of the liquor amnii retards dilatation of the os, prolongs labor, intensifies the suffering of the woman, increases the risks of the fœtus, and augments the difficulties and dangers of efforts to correct transverse and other abnormal presentations. Protracted persistence of the membranes wastes uterine power, lessens its propulsive force, delays retraction of the cervix, and may prevent the engagement of the presenting part. The tensile strength of the membranes varies from four to thirty-seven and a half pounds. The propulsive force which bursts the bag of waters is frequently, in natural labors, quite sufficient to complete delivery; hence it is obvious that in many such labors the ovum would be expelled with membranes entire if artificial rupture had not been accomplished. In those cases of persistent membranes where the tensile strength is at or near its maximum, or even above the average, it is equally obvious that delivery is delayed, and there is an unnecessary expenditure of uterine force with consequent exhaustion, which is proportionate to the duration of the persistence of the membranes and vigor of the patient. In no case should the bag be permitted to advance in its integrity beyond the external surface, and in many cases an earlier discharge of the waters will be expedient. The puncture of the membranes should always be made at or as near as possible to the central portion. The tear does not, however, even when spontaneous, always take place at the most dependent part of the pouch, or even external to the os. When located high within the cavity of the uterus, there may be persistence of the bag of waters notwithstanding the gradual discharge of liquor amnii. In such cases the child may be born with a "caul," which is nothing more than a detached portion of the membranes, of variable size, coaptated to the scalp. Expulsion of the ovum "at term" with the membranes intact should not be permitted, and when, as in very rare instances, it does occur, the child should be immediately liberated by tearing away the sac of membranes. The value of the bag of waters as a vaginal dilator is a mooted question. In cases of persistence it can hardly compensate for the delay occasioned by obstructing the escape of the presenting part through a dilated os. It is not always easy to decide whether the membranes have been ruptured or not, and very grave mistakes have been made by careless and indifferent attendants. The tension of the sac, with more or less protrusion through the dilating os during the pains, together with the stretched and thinned margin of the os, and the relaxation and flabbiness, and perhaps entire disappearance, of the pouch during the intervals, will ordinarily differentiate a persistent sac; but in rare cases, either because of the smallness of the quantity of the liquor amnii or the close adjustment of the ball-valve action of head presentations, very little or no fluid settles in the lower segment of the uterus between the descending head and underlying portion of the amniotic sac. In the former case the intact membranes may be made out by careful examination during the intensity of the uterine contraction, when the interposed fluid, however small, may be recognized by the tension and contour of the membranes. When the membranes are closely applied to the scalp, and no fluid can be discovered during the pain, the membranes may, during the intervals, be pushed into irregularities, or a finger may be inserted between the head and the cervix, thus opening a channel for the escape of fluid if the sac has been ruptured.

The dilatation of the cervix is not entirely a mechanical process. As previously stated, some of the longitudinal fibres of the lower segment of the uterus are inserted into the cervix, and the tension of such fibres consequent upon the continuous stretching of the segment influences dilatation. Dilatation is furthermore promoted by the organic changes which take place in the cervix, due to infiltration of its structure with serum, and consequent softening, increased distensibility, and lessened resistance.

THE SECOND, OR STAGE OF EXPULSION.—This is the utero-abdominal period of labor. The contractions of the uterus increase in force, frequency, and duration, and assume a propulsive character. With each contraction the head descends along the parturient canal and the cervix recedes. The expulsive power of the uterus is reinforced by the contractions of the abdominal muscles, which, though not entirely absent during the first, are greatly intensified during this stage. These forces are independent of the will. The progress of expulsion is not continuous, but only during the utero-abdominal contractions. With the subsidence of each pain the head recedes, and during the intervals the parts remain quiescent. Notwithstanding the recession, some advance is made with every effort. As the head passes the pelvic outlet the vagina is dilated and the perineum begins to stretch. When it has passed the outlet and is only covered by the soft parts, the perineum is distended and the vulvar orifice begins to open. With each succeeding contraction, which is usually increased in force at this period, the tension of the perineum increases, the vulvar opening expands, exposing to view a part of the head. The urethra is pushed upward; the anus is stretched; feces are expelled from the rectum; and the perineum and labia are thinned to such degree that the sutures may be easily traced. With each pain the expansion of the vulvar orifice exposes a larger area of the head, and finally, at the acme of a contraction, the head is born. There is always more or less laceration of the perineum. In a comparatively few cases it does not involve the muscular structure of the perineum, and may be limited to the fourchette, but frequently it is much more extensive. With the next or succeeding pain the shoulders escape and the child is extruded, followed immediately by a copious discharge of the amniotic fluid mixed with more or less blood, due to the partial or complete separation of the placenta. The cries of the child and sudden sense of relief announce to the mother the birth of her child, to which she responds with expressions of joy and gratitude. In some cases with the complete expulsion of the child the placenta is discharged into the vagina and the uterus is firmly contracted. Sometimes, in consequence of the sudden evacuation of the uterus and consequent diminution of the intra-abdominal pressure with the flow of blood to the abdominal vessels, faintness occurs. With the delivery of the child there is sudden and complete cessation of the violent utero-abdominal contractions, followed by a period of rest and repose sufficiently long to allow deliberate attention to the child by the ligation and separation of the cord and its removal. Then follows the third or placental stage.

With the descent and escape of the head through the os the vagina is dilated. But little if any resistance is offered until the vaginal orifice is reached. In some cases this presents an appreciable obstruction, which may occasion some delay in the progress of labor. As this orifice yields, the vulva, perineum, and vulvar opening undergo the process of dilatation, which in primiparæ is always attended with more or less injury.

THE THIRD, OR STAGE OF PLACENTAL DELIVERY.—The usual statement is that after the expulsion of the fœtus a short period of complete relief from pain follows; then the stage of placental expulsion begins with a slight painful contraction of the uterus, reinforced by an equally slight contraction of the abdominal muscles. Whether or not the necessary attention to the cord and separation of the child belongs to the second or third stage is immaterial in its practical aspects, but the fact is that in a majority of cases the cord is ligated and severed before the uterus resumes its contractions. In some cases the cessation of pain with the delivery of the fœtus is continuous, because with the final expellent effort the placenta is forced out of the uterus into the vagina, from which it is afterward discharged; and in rarer instances it is expelled externally simultaneously with the child. But whilst the period of placental extrusion in the greater number of natural labors is unattended with any circumstance demanding special attention, it is, nevertheless, a period of vigilant anxiety, for notwithstanding the labor may have been perfectly natural during its previous history, without the occurrence of a trivial interruption, the accoucheur may be suddenly confronted with one of several formidable and dangerous complications. In natural labors, when the delivery of the placenta is accomplished solely by the contractions of the uterus and abdominal muscles, it usually presents at the uterine orifice folded on itself with the margin inserted or projecting through the dilated and flabby os. But when traction on the cord is made prematurely or otherwise improperly, or by a shortened or coiled funis, the fœtal surface presents at the point of attachment of the cord, with the mass reflected backward on its maternal surface, thus forming a larger bulk less easy to extricate. With delivery of the placenta and secundines there follow some blood-clots and more or less fluid blood which escapes from the placental site. The removal of the placenta from the vagina, and even its removal when found extruding from the birth-canal, should be done with great care and gentleness or portions of the membranes may be detached and left in the cavity of the uterus. After removal it should be carefully examined to ascertain if the delivery is complete and no fragments of the secundines have been left to interrupt and complicate the convalescence of the patient.

The detachment of the placenta takes place in the meshy layer of the serotina and is caused by the retraction of the muscular walls. It has not been settled whether the separation begins at the margin, in the centre, or simultaneously at various points. The maternal vessels are unavoidably torn by the detachment, but hemorrhage is prevented and arrested by the formation of coagula in the torn vessels and condensation of the uterine structure.

THE EFFECTS OF LABOR UPON THE MOTHER.—In addition to the effects of parturition upon the circulation and respiration, before referred to, the female organism suffers other not less marked influences. It may, in fact, be stated that all the functions are more or less disturbed. Not infrequently, nausea and vomiting during the early stage are harassing perturbations, but do not betoken evil unless persistent and prolonged during the later stage, when consequent exhaustion and uterine inertia may seriously complicate the labor. The appetite is always lessened and generally wholly absent. The secretion of urine is usually increased, especially during the early stage, and quite often becomes a troublesome annoyance. The perspiration is increased, and during the expulsive period the surface is bathed with moisture. The temperature is elevated. Weight is diminished as the result of the evacuation of the uterus, loss of blood, increased cutaneous exhalation, and secretion of urine. Few women bear the pain of labor with composure. Mental disturbance, though most often of a trivial character, is a common accompaniment of parturition. Some are inspired with hope and exhibit courage and heroism; more often fright and evil forebodings augment the agony of suffering, increase exhaustion, and slow the progress of labor. Will-power and self-control are important adjuvants to uterine contraction and the accessory forces. Emotional conditions, so common among the coddled and luxurious primiparæ, are perplexing and vexatious complications. The functional and imaginary perturbations are so varied and multiform that natural labor among this class of females has become phenomenal.

THE EFFECTS OF LABOR UPON THE FŒTUS.—During uterine contractions the fœtus is compressed. The placental circulation is partially interrupted, the fœtal heart-beats are slowed, and partial asphyxia ensues. The head is also compressed, the bladder may be evacuated, and meconium may be discharged from the rectum. During the intermittence the pressure is removed or lessened, and the fœtal and placental circulations are relieved. The passage of the head through the pelvis effects changes in its form, marked by diminution of some and increase of other diameters, and the formation of the caput succedaneum. This is a tumor of the scalp located on that part not subjected to pressure during its passage through the pelvic canal. In anterior vertex presentations it will be found, when present, upon either the right or left parietal bone. It is an œdematous swelling, pits on pressure, but does not fluctuate.

DURATION OF LABOR.—The duration of labor is influenced by a great variety of conditions and circumstances which refer to both mother and child. Age, race, climate, civilization, circumstances of life, mode and manner of living, physical conformation and condition, heredity, primiparity and multiparity, as also the size, presentation, and position of the fœtus, are the most common and important factors which determine the duration of labor. First labors are longer than subsequent ones. Early primiparity is more favorable than late primiparity. Duration is increased by protracted intervals between pregnancies, and long intervals between late pregnancies protract labor more than long intervals between early pregnancies. Too early and too late primiparity increase the duration of labor. The periods of greatest fecundity and fertility mark the epoch of highest physiological and formative energy, most abundant recuperative resources, and maximum powers of endurance and resistance, and consequently define the period of life during which childbearing is most favorable in regard to duration of labor as well as to the survival and longevity of the patient.

The average duration of all labors is from twelve to fifteen hours; in primiparæ it varies from twelve to twenty-four hours; in the multiparæ, from six to twelve hours. There are, however, many exceptions to this statement of the general average. The writer has witnessed a labor in a young primipara not exceeding one and a half hours, without detriment to either mother or child and followed by a normal convalescence. Since the introduction of anæsthetics in obstetrics, and the more frequent and skilful employment of the forceps, protracted duration is but rarely, and then often not wisely, witnessed.

The stages of labor shorten in succession. The first is usually three times as long as the second, and the third much shorter than the second.

THE CONDUCT OF LABOR.

Childbearing is a natural process, but in civilized life, more especially in the higher walks of society, the female organism but rarely performs its duty satisfactorily without intelligent assistance. Meddlesome interference often commits mistakes, and blind expectancy omits many opportunities to promote the progress of the process and to mitigate the sufferings of the patient. The essential prerequisites of the skilful and successful obstetrician are competency, deliberation, alertness, promptness, and self-possession. Women in labor are very impressible and quick to observe, and wrongly interpret even trivial indiscretions of word and act. The confidence of the patient in the qualifications of her attendant obviates many emotional disturbances, conduces to the harmonious succession of the physiological phenomena, and completes the equipment of the woman for the ordeal of agony through which the blessings of maternity can only be attained.

Ignorance, rashness, and pretentious inertness are inexcusable in the lying-in chamber. Complications may be averted by intelligent vigilance, but the emergencies are too sudden in their advent to await the sloth and wrong of ignorance. Competency does not relate solely to a knowledge of the mechanism of labor, but must comprehend the minor details of management. A woman in labor is entitled to the full and complete discharge of every duty which is necessary or essential to her welfare, and a physician who is unfitted or unwilling to render such service should not be permitted to jeopardize her safety and life.

It is assumed that the attendance of the obstetrician has been engaged several months before the advent of labor, and that her health and the surrounding circumstances and hygienic conditions have been subjected to such supervision and management as may have been necessary to conduct her safely through the period of pregnancy and bring her to the beginning of her labor in the most satisfactory condition of health. Even in those rare cases among the primigravidæ whose period of utero-gestation has been free from the ordinary functional disturbances much good may often be accomplished by judicious explanation of the current events of parturition, and the assurance that courage and a good *morale* are important adjuvants in securing a favorable progress and termination of her labor.

Nurse.—The obstetrician should know that a competent nurse has been selected, and that she has become sufficiently acquainted with the patient to win her confidence. The time for "grannies" and superstitious intermeddlers in the lying-in chamber has fortunately passed, and the new régime of skilled and trained nurses has come to aid the accoucheur and contribute to the comfort and safety of childbearing women. The physician who will gratify the whims of capricious women by the selection of incompetent and inefficient lying-in nurses will have many occasions to regret his dereliction of duty.

Preparation.—At some convenient time, not long before that approximately fixed for the labor, the physician should direct the patient, or, better, some intelligent and confidential household companion, to obtain and put away in some safe and convenient place a small quantity of the fluid extract of ergot and Monsel's solution of iron or the persulphate of iron in mass, an anæsthetic—the usual combination of alcohol, chloroform, and sulphuric ether is preferred by the writer—some whiskey or brandy, a Davidson's syringe, several small well-washed surgical sponges, and one or more large, soft, coarse sponges to absorb the discharges and prevent unnecessary soiling of the pads and bedding. If these articles have not been provided, he should supply himself with them at his first visit, and also with a pair of forceps, a silver female and a flexible catheter, hypodermatic syringe, sulphate of morphia, needles, needle-holder, and silk and wire. Ice and hot and cold water should also be in readiness for immediate use.

Room.—The lying-in room should be large, dry, well ventilated, well lighted, and above the ground floor, and in a dwelling equally faultless in regard to ventilation, dryness, sunlight, and freedom from noxious effluvia, sewer gas, or other deleterious exhalations. All unnecessary hangings which obstruct ventilation and sunlight and afford a nidus for the collection of pernicious emanations should be removed. Sunshine promotes diffusion and purifies the air, and, in certain seasons, affords sufficient heat. A room with a southern exposure is the most desirable, because the good effects of the solar influences and dryness are more constantly and easily secured. It should be heated by an open fire when necessary, and care should be taken to exclude the air of the house, which must, of necessity, be to a greater or less extent contaminated. When artificially heated it is usually the warmest room in the house, and, as the current of air from the lower apartments, closets, and cellar is in the direction of the greatest heat, the lying-in chamber, as a consequence, becomes the common receptacle of the noxious effluvia of the house. External ventilation and internal meteorology are not less important than domiciliary sanitation. When the atmospheric conditions are unfavorable and open-air ventilation is inadmissible, or at least only available to a limited extent, the meteorology of the room can be improved by excluding the foul air of the domicile and heating the room with an open fire, which warms and dries the air and promotes diffusion and ventilation.

First Visit.—The first visit of the accoucheur, as well as his subsequent conduct, should be characterized by circumspection, gentleness of manner, affability, and a courteous regard for the innate modesty and sensibilities of women. Personal cleanliness and neatness of dress inspire the patient with respect and admiration. The odors of tobacco and alcohol are obnoxious to many well-bred women, and sometimes the first whiff of an alcoholic breath will shake her confidence and quickly induce manifest discontent. After a pleasant and well-chosen remark or two to secure her attention and quiet surprise, he should calmly and courteously introduce the object of his visit by pertinent inquiries in regard to her condition, with special reference to the frequency, location, duration, and intensity of her pains, together with such general inquiries and observations as may indicate his interest in her case and sympathy for one whom he is to conduct safely through her travail. When such preliminary conversation has been finished, at his suggestion the nurse will arrange the patient in bed, preferably in the left lateral position, preparatory for a vaginal exploration. In the mean time, in another room to which he has retired, he should thoroughly cleanse his hands, wipe them dry with a clean towel, and then bathe them with some disinfecting fluid. When summoned by the nurse, with the index and second fingers of the right hand lubricated with carbolized vaseline or other innocuous substance, and a clean towel to conceal his hand after the examination, he should approach the bedside in an unobtrusive manner and explain to the patient, especially if a primipara, the object of the examination, its necessity for his guidance and her welfare, with the assurance that it need not occasion pain. This exploration should begin during an interval, but may continue through the succeeding pain, and should determine whether labor has begun, and if so, its progress. It should be sufficiently complete to ascertain the extent of dilatation and the condition of the cervix and os, presentation and position of the fœtus, hardness and flexibility of the head, size and condition of the pelvis, length of the vagina, amount of vaginal secretion, presence of fecal masses in the rectum, effect of the pains, and state of the bladder, perineum, and vulva. The vaginal examination should be as thorough as possible without needlessly worrying the patient and exciting by too long continuance the suspicion of something wrong. It is advisable, though not always expedient with primiparæ at this stage, to confirm the diagnosis of position and presentation of the fœtus by abdominal palpation, and in the case of failure to make such diagnosis by vaginal exploration—rare with careful and experienced obstetricians—abdominal palpation should be insisted on. An early diagnosis is imperative. After having completed it, such frank statements of a favorable condition should be made to her as truth and conscience will permit. The simple declaration that "all is right," uttered in a confident and assuring manner, may obviate a panic and inspire her with feelings of actual pleasure. Lying is never permissible, but in unfavorable cases reserve, tact, and caution are available expedients to afford escape from direct questions. Whatever communication is made should be accompanied with the emphatic statement that the progress and duration of her labor will necessarily depend upon the character of the pains, and in some measure upon her submission to the inevitable suffering, and that he will render every proper service to lessen the duration and intensity of such suffering.

Absence.—Having acquired the necessary information, she may be required to remain in bed or resume the sitting posture, walk about the room, and engage in such harmless diversion as may seem expedient. It may not be necessary, and is not always wise, for the obstetrician to remain in the room or house, but before leaving the house he should direct how the bed is to be prepared and ascertain that all the necessary appurtenances for the care of the patient during and after her confinement are in readiness; that a pair of scissors and a ligature are conveniently placed for his use in securing the cord; and that the clothing of the child is properly prepared and ready for use. He should indicate the time of his return, and how and where he may be found should his presence be required before the expiration of the stated time of absence.

Bed and Bedstead.—Attention to the location of the bedstead and preparation of the bed are important. High head- and foot-boards are inconvenient annoyances, obstructing easy and proper handling of the patient. The bedstead should be so placed as to afford every facility to the accoucheur and nurse for access to, and care of, the patient, and to secure good light when and where needed, without exposing her face to the glare of artificial or sun light or her person to draughts of air.

Feather beds are an abomination, and spring mattresses are not less objectionable. A good, smooth, easy, and firm mattress of hair, free from irregularities, lumps, and depressions, with one or more good pillows, clean sheets of cotton cloth, and a safe and firm bedstead, will supply all the necessary appurtenances of a good bed. Over the mattress should be spread a sheet, upon which an impervious cloth of sufficient size to protect it and the mattress from the discharges should be smoothly laid and fastened at each corner to the mattress with safety pins. Upon this should be laid a thick and soft pad of such material as will rapidly absorb the discharges. Then the upper sheet and such other bed-clothing as will be necessary to cover and protect the patient from exposure, so arranged as to be easily removed and readjusted as occasion may require, should be added. Blankets should always be in readiness, for flushes of heat and sensations of cold are common accompaniments of parturition.

Antisepsis.—These preparatory arrangements, which refer to the comfort and security of the patient and to the convenience of the accoucheur, must be supplemented by an equally complete preparation for, and assiduous application of the principles and practices of, antiseptic midwifery. Inexcusable neglect and inefficient and careless administration of the well-known rules and recognized appliances of obstetric antisepsis must, in view of their admitted value, be regarded as criminal. The nurse as well as the medical attendant must be animated by the highest sense of personal responsibility, that wanton neglect or lack of diligence may not yield results fatal to the mother and deservedly injurious to their reputations.

Attention to Details.—The narration of the foregoing details may seem superfluous to the experienced practitioner, but the proper conduct of natural labor so clearly requires their vigilant and faithful execution, and their value has been so fully demonstrated by common experience and scientific investigation, that no apology is needed in a work of this character for their repetition. In fact, it is fully justified by the too frequent omissions and bungling methods of execution of many who undertake the service of the accoucheur only to display inexcusable ignorance and disregard of life. The minimum mortality of childbearing cannot be reached and maintained until the enforcement of the laws of hygiene and antisepsis has become universal among obstetricians.

The following discussion of the management of labor will be based upon the assumption that the head is presenting in the left occipito-anterior position, well flexed, in a normal pelvis, with a dilatable os and perineal and vulvar orifices; that the pains are regular and persistent, with gradually increasing intensity; that we have a docile patient with a good *morale;* and that the necessary appurtenances of a proper lying-in chamber have been provided.

Management of the First Stage of Labor.

Ordinarily, there is not much for the physician to do during this stage, and his presence is not necessary except at proper intervals. The examinations should not be repeated oftener than necessary to ascertain the progress of dilatation. Frequent manipulation is not only useless, but sometimes injurious, and very apt to excite unpleasant suspicions on the part of the patient. If the rectum is clogged with fecal masses an enema should be administered. The patient should not be confined to the bed, but encouraged to sit up, walk about the room, and occupy herself in some agreeable diversion. The bladder should be frequently evacuated by voluntary effort, but in cases of retention either a silver or flexible catheter—whichever can be introduced with most ease and least discomfort to the patient—should be employed. She should be encouraged to let the pains pass, come, and go without any straining or bearing-down effort. Usually but little food is taken, but it may be advisable to insist that some simple aliment be taken in moderate quantities at reasonable intervals to prevent exhaustion. Drinking-water should be allowed at pleasure.

As the end of this stage approaches, which is usually indicated by the character of the pains, size and protrusion of the bag of waters, extent of dilatation of the os, and tension of the lower uterine segment, the patient should be put to bed and her clothing so arranged as to be protected from soiling by the discharges.

As a rule, the membranes will rupture spontaneously during the acme of a pain, marked by an audible gush of fluid and a simultaneous call of the patient for the nurse. As much as possible of the discharged fluid should be immediately removed by the employment of one of the large sponges in readiness for the purpose: indeed, when anticipating the rupture, it will often be convenient and add much to the comfort of the patient to have the nurse in proper position ready to protect the bed and clothing and make the patient as dry as possible. When the sac is persistent and causing delay in the progress of delivery, artificial puncture is advisable, and may, in some cases, be imperative. It may be accomplished by a prick with a hairpin, toothpick, or sharpened finger-nail gently thrust against the most dependent part of the bag of waters during a pain. A long or voluminous sac will require but little care, but a small, tense sac demands both care and gentleness or injury may be inflicted on the scalp. With the discharge of fluid Nature pauses in her efforts, to resume with renewed vigor during the stage of expulsion.

MANAGEMENT OF THE SECOND STAGE OF LABOR.

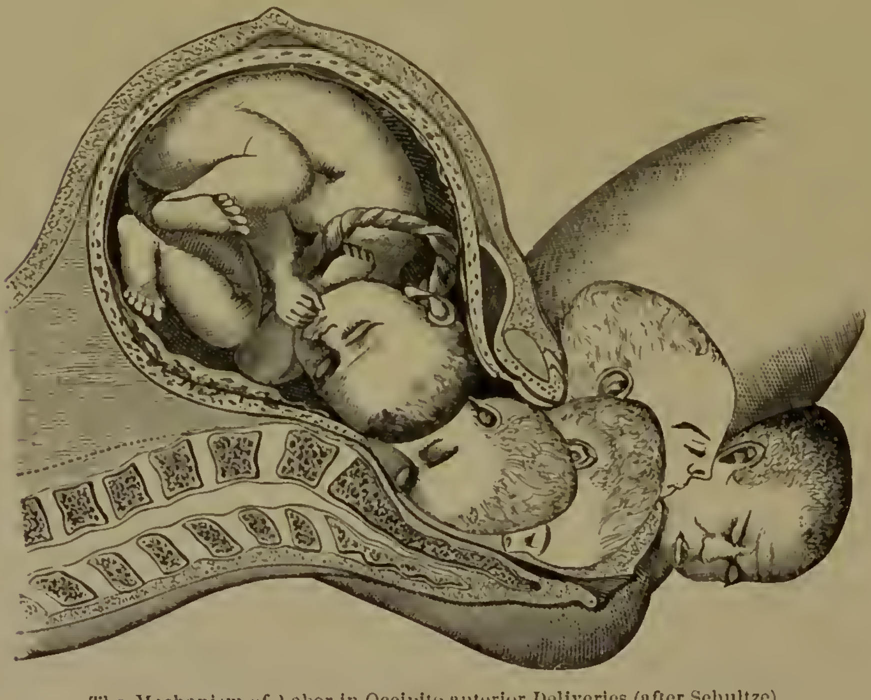
The second stage of labor requires the presence and constant attention of the accoucheur, and the patient should be required to remain in bed. The desire to pass water and evacuate the bowels should be relieved by the use of the bed-pan. Getting upon the commode has sometimes led to very surprising and injurious results, such as the unexpected discharge of the fœtus, attended with serious laceration of the perineum. Hot and cold water, ice, the ligature and scissors, and ergot should be in readiness for use. The presence of persons other than those actually needed as assistants should not be permitted. Sympathizing women and affectionate friends and relatives are bad companions for a woman in labor and troublesome interrogators to a truthful and conscientious obstetrician. The position of the patient in bed may be left to her selection. The physician should accustom himself to either the dorsal or left lateral posture, and to the use of either hand in making a vaginal examination. But during the later period of this stage the left lateral position is most desirable and convenient, and will quite frequently expedite the expulsion of the fœtus. It affords greater facility for such proper and neat attention as the vaginal and rectal discharges may require, and also permits inspection of the stretching of the perineum and dilatation of the vulvar orifice.

During the pain succeeding the discharge of the waters an examination should be made to verify the diagnosis of left occipito-anterior position and flexibility of the head, and to ascertain the condition of flexion, progress of descent and impulse and recession of the head, and to measure the effect of the uterine contractions. The examinations may be made sufficiently often to follow closely the progress of expulsion, but meddlesome interference should be avoided. As the labor proceeds the posterior fontanelle will be easily distinguished, and the caput succedaneum will gradually form, to a greater or less extent, upon the posterior and superior angle of the right parietal bone.

The conduct of labor is so commonly associated with presentation of the vertex in left occipito-anterior position that a brief description of the process of labor in this connection is necessary. The mechanism of labor in this position of the head is marked by certain clearly-defined acts by which its progress must be studied.

Descent and flexion are not synonymous terms. They are synchronous acts. The head enters the pelvis in the axis of the brim, and as it encounters resistance the occiput descends and flexion takes place, increasing with descent until the chin rests against the chest. When the head reaches the perineal floor the movement of rotation occurs, which brings the occiput under the arch of the pubis. As the head passes through the inferior strait, and sometimes even before, extension begins, and is completed with its extrusion through the vulvar orifice. Extension commences with engagement of the head in the inferior strait, and as it proceeds the sagittal suture glides along the distending perineum and the vulvar orifice expands, exposing a continuously increasing area of the occiput to observation immediately under the arch of the pubis. When the forehead has passed the coccyx, retraction of the perineum begins, and as it recedes over the face the occiput is thrust forward and upward over the pubis. As soon as this is accomplished the head is delivered and the movement of restitution takes place, whereby the occiput is rotated toward the side along which it descended in the passage of the head through the pelvis. This change in position of the head is effected mainly by the rotation of the

FIG. 213.

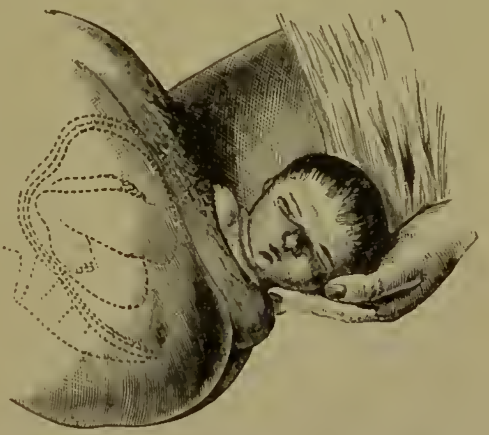


The Mechanism of Labor in Occipito-anterior Deliveries (after Schultze).

shoulders under the arch of the pubis, and partially by release of the torsion of the neck produced by the previous rotation of the head. As soon as the head is delivered the cord, if coiled around the neck, should be released by traction upon the placental end, so that it may glide over the shoulders, or the loop may be slipped over the head. In the rare cases in which it is coiled several times around the neck great care and gentleness are necessary. In some cases it may be necessary to apply a ligature and cut the cord. It should be cut between the ligature and the placenta, and delivery should be hastened by pressure upon the fundus of the uterus and gentle traction upon the fœtus.

The Delivery of the Shoulders.—When the head has emerged from the vulvar orifice, one hand should be in position to support and hold it, as shown in Fig. 214, until the trunk has been delivered. The other hand should be employed in compressing the uterus and following it down with firm and even pressure. This downward pressure should be made during the contractions, but the hand should be held firmly in position during the intervals, and when removed to enable the accoucheur to give the necessary attention to the delivered child, it should be replaced by the hand of the nurse, who should keep up continuous but not rough pressure until he can resume complete management during the placental stage. As a rule, nothing more is needed to complete the delivery of the shoulders and trunk, but if the contractions of the uterus should be slow and feeble and the bearing-down efforts of the patient ineffective, contractions may be excited by friction with the hand over the uterus, and the patient may be instructed to hold her breath during the pains and reinforce the uterine contractions by pressing downward as if at stool. If the anterior shoulder should be caught by the arch of the pubis, it may be liberated by moving the head backward and then reversing the motion to deliver the posterior shoulder. In some cases it may be necessary to make gentle traction by grasping the head with both hands or by inserting a finger or blunt hook under the perineal shoulder, and, if failing then to complete delivery without too much traction upon the head, traction may be made from both axillæ. Such expedients are not often necessary, but

Fig. 214.



External Rotation of Head in First Position (after Parvin).

if delay is protracted and the life of the child is endangered, manual interference may become imperative.

As soon as the head is delivered and the neck liberated from the coiled funis, if the cord be around the neck, or not later than immediately after the delivery of the placenta, a drachm of the fluid extract of ergot, diluted with water, should be administered. The routine administration of ergot at this stage of labor is approved and practised by many, if not a majority, of the most experienced and successful obstetricians, because it secures firm and persistent contraction of the uterus, lessens the danger of post-partum hemorrhage, protects, in some measure, the patient from septic complications, and promotes involution, whilst the dangers, if any, of producing hour-glass contraction of the uterus are too remote for consideration.

After the extrusion of the shoulders the birth of the child is usually speedily effected. If any delay should occur, the delivery of the remaining part should be expedited by traction upon the trunk. The completion of the birth is usually announced by vigorous crying of the infant.

ATTENTION TO THE CHILD.—As soon as the child is born it should be removed, but not far enough to make traction upon the cord. If necessary to facilitate respiration, any secretions should be removed from the nose and mouth with a finger covered with some soft material. Respiration may be promoted by sprinkling cold water in the face, friction of the chest, slapping the buttocks, tickling of the fauces with a feather, or momentary inhalation of ammonia, or artificial respiration.

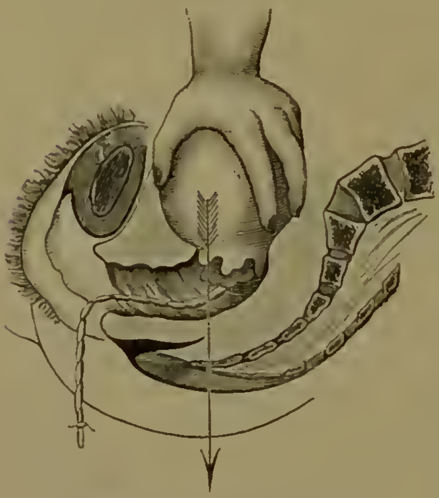
LIGATION OF THE CORD.—Notwithstanding occasional attempts to deride the ligation of the cord and to prove its uselessness and injury, it continues to be practised by every careful obstetrician, not because it is necessary in every case, but because no one can tell when it is not necessary. As a rule, the ligature should not be tightened until the pulsations in the cord have ceased, for it has been proven that immediate ligation deprives the infant of an amount of blood which is injurious. But it is not prudent to delay ligation beyond a reasonable period, say fifteen minutes. The cord should be stripped for several inches from the umbilicus by gently pressing along its continuity with the thumb and index finger, to displace, as far as practicable, the gelatinous material, and about two inches from the abdominal surface the ligature should be placed and firmly tied without cutting the tissues. The ligature may be either narrow bobbin or silken or hempen cord, sufficiently strong, but not fine enough to cut the cord. A second ligature should be placed two inches distant to secure the placental end. The second ligature may not be necessary, but is always judicious, and is believed by some to promote the detachment of the placenta, because of the retention of the blood and consequent increased bulk. In cases of multiple pregnancy there may exist vascular connection between the fœtuses.

After having placed and securely tied the ligatures, the cord should be severed midway between them with a pair of blunt-pointed scissors, care being taken not to injure the fingers or toes of the child, which are apt to be in the way. The cut surface of the fœtal end should be wiped dry with a cloth or cotton wool to discover any hemorrhage, and when satisfied of security against bleeding, and not till then, the child should be carefully removed, wrapped in a warmed blanket, and laid on its side in some safe place where it can be kept warm and free from injury until it can be washed and dressed. Caution suggests occasional inspection of the cord, and if there is any sign of oozing of blood another ligature should be applied.

Delivery of the Placenta.—The concluding stage of labor demands immediate attention after the separation and removal of the infant. If the process of extrusion of the fœtus has been followed by firm and equable downward pressure over the uterus during the later moments of the expulsive stage, and firm and continuous pressure has been maintained during the succeeding interval whilst attention is being given to the ligation and cutting of the cord, the placenta will, most usually, be found partially or wholly expelled from the uterus and lodged in the vagina, from which it can be withdrawn by gentle traction upon or prolonged tension of the cord, or, better, by hooking the mass with a finger, care being taken not to tear the cord from its placental attachment or to injure the substance of the placenta. Whilst it is being thus extracted it should be supported by the left hand, so that undue dragging upon the membranes may be avoided and their extraction may be accomplished without leaving any fragments in the uterus. The secundines are so very fragile and easily torn by rough and hasty handling that great care and gentleness is necessary to secure their complete delivery. A vessel should be in readiness, and so placed, closely to and beneath the vulvar orifice, as to receive the placenta, blood-clots, and fluid without unnecessary soiling of the clothing and bed. Twisting of the membranes during their withdrawal is not necessary, nor can it conveniently be done with a vessel properly placed.

If the placenta cannot be so easily delivered, it should be expressed by the method of Crede, which consists in gentle friction with the hand applied over the fundus of the uterus, and during a contraction by a firm downward pressure with the palm of the hand smoothly applied over the fundus, the fingers extending over the posterior and the thumb over the anterior surface. This manipulation may be repeated if necessary until the placenta and all blood-clots are squeezed out of the uterus and the organ is secure in the state of firm and persistent contraction. The hand should be held in position grasping the uterus, as above described, during the delivery of the placenta, by moderate not always strong pressure, until complete contraction is assured and maintained; but only when necessary to reinforce the spontaneous efforts should friction and force be employed. Ordinarily, the employment of the hand is simply cautionary to detect and prevent relaxation and consequent hemorrhage. Having completed the extraction of the placenta and secundines, and secured firm contraction of the uterus, the patient should be cleansed by washing off all blood-stains from her person and removal of soiled clothing, pads, and bed-linen preparatory to the adjustment of the binder. The external genitalia should be dressed with great tenderness to avoid giving pain. A warm disinfecting fluid should be used for this purpose, and a wash-rag of some soft material is preferable to even the finest sponge, because it is less irritating to the sore and tender parts. The hand over the uterus should be held in position until the binder is applied, or at least very frequent examinations should be made to discover any symptom of, or actual, relaxation and hemorrhage. Every precaution, however trivial it may seem and tedious it may be, may be necessary at this critical period to protect the patient from the spoliative and dangerous complications of post-partum hemorrhage. Until the uterus is firmly contracted, the binder properly adjusted, and the patient comfortably arranged in bed, no woman can be considered safe, and no practitioner is justifiable in omitting any precautionary measure to prevent the occurrence of such a destructive complication.

FIG. 215.



Expression of the Placenta (Credé).

The vulva and perineum should be carefully inspected. If the perineum has sustained injury by tears beyond the parting of the fold of mucous membrane known as the fourchette, one or more sutures may be necessary, and if so should be introduced at once. Immediate perineorraphy is commended to the careful consideration of every judicious obstetrician. Trivial tears or injuries of the vulva or perineum may be dressed with some disinfecting application; dusting with iodoform is usually all that is needed.

APPLICATION OF THE BINDER.—The good effects claimed for the binder, when properly adjusted and fastened, are the preservation of the figure, compression of the abdomen, restoration of intra-abdominal pressure, compression and fixation of the uterus, prevention of relaxation of the uterus and consequent hemorrhage, and promotion of involution. It should be made with gores, to be easily and smoothly applied, so that it will remain in position and not slip away from its proper adjustment and become an annoyance, increasing the discomfort rather than adding to the ease of the patient. If one has not been prepared, a crash towel or a piece of cotton cloth may be used. It should be rolled on itself from one end to its middle, and the roll should be carried under the back of the patient to the opposite side, then unrolled and smoothly applied, extending from the chest downward below the symphysis pubis and over the hips. A pad made of a folded towel or any convenient and clean material should be placed over the fundus of the uterus, and the bandage drawn tightly and secured with safety pins, beginning at the lower margin and placed sufficiently close to secure smoothness and equable pressure.

The final act of placental delivery having been accomplished, the patient should be comfortably arranged in bed, with sufficient bed-clothing to maintain warmth, and allowed to rest quietly. A soft antiseptic pad should be applied to the vulva, and a clean folded sheet laid beneath her to protect the underlying bed-clothing from being soiled.

In applying the binder care should be taken not to expose unnecessarily the person of the patient. The modesty of women does not forsake them even under such trying circumstances. A clean warmed towel may be used to conceal the genital organs while the binder is being adjusted, and removed when it is properly placed.

Dressing the Child.—The necessary attention to the mother having been fully and completely discharged and her rest and repose having been secured, the child should be washed and dressed. This is usually done by the nurse, but should be done in the presence and under the supervision of the accoucheur. A vessel of clean warm water, a soft sponge, a piece of old, well-used cotton cloth, some vaseline, sweet oil, or other innocuous oily substance, and a piece of castile or other good soap, should be in readiness. The scalp and body of the child should be gently rubbed with the oily substance to facilitate the removal of the vernix caseosa, care being taken to clean the folds and joint-flexures, and they should then be wiped dry. The face should be washed with clean water without soap to avoid irritating the eyes, and dried with a clean soft cloth. Washing the child should be done gently, quickly, and dextrously in a warm room, without unnecessary or prolonged exposure. If, as is occasionally the case, the vernix caseosa cannot be removed without rough or too prolonged handling, or the infant is too feeble to be subjected to the necessary rubbing, its thorough and complete removal may be left until the next day. After washing the infant the cord should be dressed. Various methods of dressing the cord have been suggested and practised with equal success. Some use a square piece of soft linen or muslin, with a hole in its centre through which the cord is drawn; sometimes it is smeared with simple cerate or other equally objectionable fatty or oily substance; and by others it is slightly scorched. The linen should be smoothly folded around the cord. Some simply express the gelatinous substance from the cord and leave it without any dressing; others surround the cord with absorbent cotton; and others sprinkle it with iodoform or salicylic acid and wrap it with a few turns of a narrow bandage. A simple plan is to take a narrow piece of very soft linen or muslin three or four times as long as the cord, slightly notched at one end to fit neatly around the base of the cord. Adjust the notch and fold the cloth laterally upon itself over the cord and throughout its length; then fold it lengthwise along the cord on the side to be laid against the abdomen of the infant, and by reversing the fold, carrying it over the cut end and along the upper side, the cord will be enveloped smoothly and completely. No other dressing is necessary, and the cord and dressing will fall off together on the fourth or fifth day.

The cord, either dressed or stripped as the case may be, should be laid longitudinally and evenly on the abdomen, and the "belly-band," made of soft flannel, applied. This should be done with great care—not too tightly—and it should then be fastened with a few safety pins so arranged as not to injure or irritate the infant. The clothing should fit neatly, but loosely. Pins should never be used; tapes are preferable.

During the time occupied in washing and dressing the infant the accoucheur should examine the condition of the patient. The pulse, respiration, and condition of the uterus demand special attention. If there is any suspicion of relaxation of, or accumulation of clotted blood in, the uterus, it should be compressed firmly after the method of Credé, to restore contraction and squeeze out the clots. This may be repeated as often as is necessary. The physician should not leave the patient within the first hour of her puerperium, and not then without giving directions in regard to feeding the mother and nursing the infant. As a rule, the child should be put to the breast within the first two hours after its birth, and the mother should have some bland liquid food not later than three hours after the completion of her labor, unless sleeping, and then upon waking.

In cases of multiparæ it is always advisable to leave with the nurse directions with regard to the management of after-pains, but narcotics will rarely be necessary if care be taken to expel all blood-clots from the uterus before leaving.

The conduct of labor is modified in many of the minor details by the employment of an anæsthetic. The foregoing history of the conduct of natural labor has been written upon the basis that none has been used, but this course is not advised by the writer. Anæsthesia in obstetrics is second only to antisepsis. The discussion of the subject of obstetric anæsthesia belongs to another place, but the writer desires to conclude the description of the conduct of labor with the definite expression of his unqualified approval of the judicious use of anæsthetics in labor.

THE CARE OF THE PERINEUM IN NATURAL LABOR.

Much has been written in regard to the necessary care of the perineum during the passage of the head through the vulvar orifice, and many methods of preservation have been devised and recommended by obstetricians. Every method has its advocates, and every case in which any method is applied without the occurrence of rupture is offered as proof of its protective value. This enthusiastic advocacy is based upon a fallacy which may as well be admitted and plainly stated. Lacerations of the perineum have probably occurred from the beginning, and will continue to occur to the end, of childbearing, notwithstanding the employment of methods of prevention however well devised and carefully applied by the most skilful obstetricians. The escape of a perineum from rupture is no more proof of the protective value of the method employed than rupture is proof that its application was conducive to the injury in the case in which it occurred. It is quite as reasonable to assume that the elastic tension and expansile property of the soft parts were equal to the occasion as that support of the perineum facilitated the exit of the head through an orifice too small to admit its passage. The frequency of laceration, like other accidents of parturition, varies in the practice of equally skilful and careful accoucheurs, whether or not they employ the same methods or vary them. The inventor of a new device will herald his success, and another practitioner, equally conscientious, skilful, and watchful, will, after a fair trial, abandon it because of its utter worthlessness. The fact is, that in the former instance no more lacerations would have occurred if any other, or probably no, method had been employed, and in the latter an equal number would have occurred if any other method had been practised. One ascribes his success to good and the other his failure to bad management, when, in fact, it was the same in both classes of cases and did not affect the result in either class. The lacerations were unavoidable, and one obstetrician was more unfortunate than the other in having more of such cases than the other.

It is not, however, denied that lacerations of the perineum may be prevented or limited, and it is asserted with even more emphasis that labor may be completed without parting of the fourchette. It is furthermore maintained that perineal tears do not always begin in the mucous surface. The writer has on several occasions watched the process in primiparæ fully anæsthetized and entirely incapable of voluntary effort. In such cases when the parietal eminences were embraced by the thinned and tense rim of the vulvar orifice the tear has begun in the external layer of the integument, about one inch behind the margin of the commissure, and expanded into a circle, leaving the mucous membrane entire. With the succeeding and last contraction of the uterus the mucous membrane yielded, and the tear extended forward with the escape of the head. This has been the history of several cases of rupture occurring in primiparæ in which he has had the opportunity of carefully watching the process, with the patient in the left lateral posture, notwithstanding the employment of methods of prevention by manual interference.

Lacerations usually extend along the median line of the perineum, and may involve the sphincter ani muscle and recto-vaginal septum. In rare cases central perforation takes place and the head is thrust through the tear. In some cases the mucous membrane is torn without involving the skin. But few primiparæ escape tearing of the fourchette.

Tears begin in the tissue and at the point where the elasticity and resistance are the least or where the force is the greatest. The frænulum is the thinnest, weakest, and most attenuated part of the expanded and tense rim of the orifice. In occipito-anterior positions it quite often, if not most frequently, begins at the acme of a pain with the escape of the brows, and extends backward in the median line until the tension is relieved. If the pain and propulsion of the head are continuous, the laceration will be more extensive. Rupture occurs less often in anterior than in posterior positions of the occiput, the tension of the frænulum being less because the space beneath the arch of the pubes is more available.

Laceration is not necessarily nor always an unfortunate injury. It is sometimes preferable to long-continued stretching and bruising of the soft parts. In rare cases sloughing has followed the bruising and crushing of the tissues by persistent pressure and stretching, and every operator has secured better results in immediate perineorrhaphy in cases where the tear occurred early than in those in which it took place after prolonged distension and bruising.

The frequency of lacerations is approximately stated to vary in primiparæ from 20 to 30 per cent., and in multiparæ from 5 to 10 per cent. Of these, 15 per cent. are estimated to be due to defective expansibility of the perineum and the size of the head. The most reliable statistics, collated from the clinic at Halle as the result of ten years' observation of preventive measures, rate the lacerations in primiparæ at 21.1, and in multiparæ at 4.7 per cent. These statistics refer to tears extending beyond the commissure. The classification into avoidable and unavoidable is based upon limitations which place the unavoidable class far below its actual rate of occurrence. The only logical conclusion to be drawn from ten years' careful and expert employment of preventive measures in a large obstetric clinic is that the percentage of perineal ruptures establishes the ratio of frequency of unavoidable lacerations, and that the avoidable are as near *nil* as science, art, and skilful interference can make them. If these figures and statistics prove anything, this is the inevitable conclusion, and they clearly show the futility of methods of prevention. Such conditions as threaten laceration may appear to, and yet may not, exist, for there is no method of measuring the expansibility of the perineal structures, elasticity of the vulvar orifice, or excess of propulsive power, except by the absence or occurrence of rupture. Hence the statistical argument in favor of perineal support is fallacious, because it is based upon a mistaken diagnosis and an unavoidable result.

In estimating the frequency, the age at first labor, the condition of the perineal structures and of the patient, and the circumstances of labor should be considered. Primiparity at suitable ages is less frequently a cause than primiparity at advanced age, and the farther advanced the age the greater the liability. The great difference between the estimated ratios of frequency in primiparæ and multiparæ proves conclusively that the injury is most often due either to some condition of primiparity or to the position and size of the fœtal head; and the rarity of occurrence in multiparæ shows even more clearly either that rupture had occurred during a first labor, or, occurring in a later one, was occasioned by some anomalous condition peculiar to the case, which classes it among the unavoidable injuries of parturition.

The various causes of perineal laceration may be concisely stated as follows: Unfavorable position and size of the head; too rapid extension in occipito-anterior and insufficient flexion in occipito-posterior positions; precipitous expulsion; injudicious voluntary efforts; acuteness of subpubic angle; rigidity, thickness, diminished expansile property, and too rapid retraction of the perineum; slow or insufficient dilatation of the vulvar orifice; conditions of the perineal tissue due to improper development and previous disease; awkward handling and injudicious and hasty traction in forceps cases, as also failure to remove them when the obstacle to delivery has been overcome, or to antagonize the expulsive forces at the proper moment when the head can be firmly held *in situ* by the grasp of the instrument, thus affording time for full development of the elastic power of the perineal structures; and the improper use of ergot or other oxytocics. Hasty traction or precipitous expulsion of the shoulders may also be enumerated among the causes. In some cases the tense and thinned margin of the commissure is nipped by the nose, and the tear thus begun is caught and extended by the passage of the chin.

A glance at the foregoing array of causes ought to convince the most enthusiastic advocate of manual prevention that when the cases of laceration due to natural causes beyond the control of art, and to improper interference with the normal course of labor, are eliminated, comparatively few will remain to afford opportunity for the exhibition of skill in prevention. It must be equally clear that measures directed to the support of the perineum without removal or arrest of the cause must prove ineffective. If the vulvar orifice is too small to permit the passage of the head, or if the expansile property of the perineal tissues is insufficient to allow ample stretching, or if their tensile strength is less than the expulsive power of the expellent forces, rupture is inevitable. In such cases mere support of the tense and thinned tissues either by the application of the hand or adjustment of a bandage must be futile.

The proper care of the perineum consists, then, in omitting the interferences that are believed to cause injury. Omit the improper use of ergot and all manipulations which excite the reflex forces; suspend the injudicious voluntary efforts; correct the defects of flexion and extension; diminish the expulsive power of the uterine and abdominal contractions; arrest the advance of the head and slow its exit, so that the attenuated perineum will gradually retract and glide over the irregularities of the face without tearing beyond the commissure; and prolong the perineal stage. These suggestions refer to the removal, lessening, and arrest of the cause, and not to the propping up of an attenuated and fragile tissue, whilst the forces or causes are continuously operating with probably increasing intensity. The acts of omission are quite as important as the acts of commission.

Obstetric narcosis and the forceps subserve the purposes of delay and antagonism far more effectively than manual resistance or perineal support. Narcosis, though not often necessary or prudent, may be pushed to complete arrest of the progress of expulsion. It should not, however, be carried to that degree. The object should not be to suspend labor, but to lessen the force of the uterine and reflex forces, so that full development of perineal and vulvar dilatation may be attained. The same may be accomplished, but to a less degree, by the employment of the forceps. As a rule, however, the progress of propulsion in such cases is too precipitous to afford time for their adjustment; but in cases where they may have been previously applied the operator, by the exercise of a moderate force of resistance, can slow the exit of the head. The conjoint employment of narcosis and the forceps is more effective than either separately, because the force is lessened and the resistance to propulsion is increased. If by either or both conjointly the intermittent character of the utero-abdominal contractions can be maintained or re-established, a favorable result will be more probable. A less effective but more popular method consists in slowing the escape of the head by pressure with the thumb against the occiput, whilst with the fingers applied near the border of the commissure rotation under the arch of the pubis is promoted. This is merely employment for one hand, unless aided by control of the accessory forces; and when such aid is effective the hand-power is nugatory, except so far as it may effect rotation; and this may be more easily and certainly accomplished by inserting a finger through the rectum in the mouth or under the chin of the child. By this latter manipulation the head may sometimes be held in position, or rather recession during the interval may be partially arrested, so that continuous moderate pressure is maintained against a dilatable orifice. Lusk asserts that he has accomplished delivery of the head and avoided rupture by imitating during the intervals the intermittent character of the pains, by establishing a to-and-fro movement of the head with a finger under the chin of the child.

Shelling-out processes, which refer to delivery of the head during the intermission of contractions, are based upon the hypothesis that a head which cannot pass an elastic orifice at its maximum dilatation will roll out of its own volition, or that the orifice can be slipped over the head when its property of expansion is at its least tension. An orifice that can be stretched over a head in recession will not tear when stretched by the wedge-like pressure of the head against it.

These digital manœuvres have been modified by combining occipital and rectal pressure. The head is grasped by the hand with the thumb inserted far into the rectum and the fingers over the occiput. By this fore-and-aft grasp the head may be held and progression and extension may be partially controlled. Its effectiveness will vary greatly with the relative size of the head and hand. A large hand with a small head will do very effective work, but a small hand with a large head will not accomplish much. A head propelled by a fifty-pound pressure will not tarry long in such a grasp. Apart from the inutility of rectal expression, direct injury may be inflicted upon the gut by rough and too long-continued pressure. Æsthetic considerations should never exclude an effort that promises a beneficial result, but the introduction of a finger into the rectum is always repugnant to a female.

Perineal relaxation has been advised by two very distinguished obstetricians. Playfair's method consists in forward pressure made along the sides of a distended perineum with the thumb and fore finger, whilst with the tips of the other fingers applied to the vertex the exit of the head is retarded. Goodell's method is executed by drawing the perineum forward with the fingers hooked into the rectum and slowing the advance of the head by pressure with the thumb. This is an artificial effort to increase the stretching of the anus, which always takes place, and is not unreasonable; but, like some other measures, it is applied at the wrong end. It is not anal stretching, but dilatation of the orifice, that is most needed. The possibility of exciting reflex movements by these manipulations is an objection to their employment. More harm may be done than good accomplished. The equable pressure of the advancing head is a much more effective force to develop the expansile property of the tissues than digital stretching during the intermissions, which cannot be applied uniformly to the distending surface.

The methods of direct support to the perineum consist in the application of the hand or a bandage. The hand may be applied with the palm resting against the bulging part and fingers toward the orifice, or the position of the hand may be reversed. In either case, pressure should only be made during the pains in such manner as to favor extension or flexion as the position of the occiput may be anterior or posterior, and to promote rotation of the head under the arch of the pubes. The preferable position of the hand is with the fingers toward the orifice, that pressure may be made with the tips along the margin of the tense rim. A better method than either of these is to pass the left arm between the thighs, the patient lying in the left lateral posture, and grasp the perineum with the palm against the convex part of the most distended part. By this method the operator may exercise very considerable force.

Reamy and Price have suggested the application of a bandage. Reamy[1] places the patient "on her back across the bed, with nates brought to its verge." "The thighs are flexed over the abdomen, and legs upon the thighs, with the knees brought close together." "Two assistants are given opposite ends of a towel or a bandage of linen about ten inches wide and forty to fifty inches long, which is carried around the buttocks and spread out smoothly with its anterior or upper edge on a level with the fourchette. They are then instructed to make traction during the pains in such amount, in such direction, and with such part of the bandage as the accoucheur may direct."

Price[2] seeks to crowd the surrounding tissues in the direction of the vulvar outlet by a bandage applied over the pubes and trochanters and fastened over a firm pad resting against the coccyx and anal orifice. By this method he claims that relaxation is secured and the head is pressed toward the pubic arch.

Laceration of the cervix uteri to a greater or less extent is not less frequent than tearing of the perineum, yet the conditions of cervical

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[1] *Obst. Trans.*, vol. x. p. 153.

[2] *Trans. Med. Soc. Pa.*, 1884.

dilatation are less conducive to injury than those of perineal dilatation. The lower segment of the uterus is more uniformly distended; the descent and direct pressure of the head are graduated by the interposition of a fluid; the os is dilated by the protrusion of the bag of waters; force is more evenly distributed and pressure is less influenced by unfavorable positions of the occiput; whereas the perineum is an elastic structure guarding the pelvic outlet, so arranged and unprotected that it must receive the impulse of the force of propulsion whilst the head is rotating under an immovable and bony archway. The force is quite as great, if not greater, and certainly more continuous, after the biparietal diameter has passed the inferior strait and the head enters the vulvo-vaginal canal, capped in front by an unyielding arch and covered posteriorly and laterally by expansile tissues which receive the brunt of the force of propulsion. The fact that in both instances the laceration begins far most frequently at the margin of the orifices, notwithstanding the tension and attenuation of the lower segment of the uterus in one and of the perineum in the other case, proves conclusively either that such margin is the point of least resistance or greatest force, and that in both cases orificial dilatation is insufficient to admit the passage of the head.

Perineal support will, however, continue in the future, as it has in the past, to command the attention of obstetricians, and methods will be tried, however useless they may be proven to be. The desire to be employed will always invoke effort, and the hope of contributing something to lessen the agony of childbearing will always animate sympathizing and impressible obstetricians.

Episiotomy.—To prevent serious laceration of the perineum some have advised that one or more lateral incisions be made with a pair of blunt-pointed scissors or a probe-pointed bistoury. If one is not sufficient, another may be made on the opposite side. The operation is not often practised, and has not received the support of obstetricians.

Resuscitation of Asphyxiated Infants.

Asphyxia neonatorum occurs in two forms—the anæmic and the apoplectic. In the former the infant is pale and limp, with cold surface and flaccid muscles. The conjunctivæ are bloodless; the mouth is open, with lower jaw hanging; and the sphincters are relaxed. The heart-beats are very feeble and frequent, sometimes not perceptible. Pulsation in the umbilical cord may be absent. Respiration is either suspended or jerking, shallow, gasping, and at long intervals. Sometimes only a slight recession of the lateral chest-walls at long intervals can be seen or felt. The apoplectic form is characterized by congestion of the surface, most marked about the head and face, and varying in color from a deep red to a purple. The lips are swollen and red, the conjunctivæ are injected, and the eyeballs protrude. The muscles are not rigid, but there are not the flaccidity and relaxation present in the anæmic form. The heart-beats are slow, but labored, strong, and full, and the umbilical vessels are distended with blood. Reflex movements may be excited. Respiration is slow and feeble at first, but gradually increases in frequency and fulness, and soon, with proper and timely treatment, is followed by audible cries. Sometimes the cry is preceded by contortions of the face, like an inaudible effort at crying.

The anæmic form may be caused by insufficient nourishment, torsion, prolapse, or compression of the cord, diseases of the placenta, disturbances of the placental circulation, feeble development, congenital disease and malformation of the infant, premature labor, excessive high temperature, or poisoning of the mother by morphia or chloral. The apoplectic form is usually the result of tedious labor, especially a prolonged second stage after too early discharge of the liquor amnii, continuous uterine contractions induced by ergot, breech presentations, and compression by the forceps. In the anæmic there is insufficient blood-supply; in the apoplectic there are local congestions and general venous excess.

In some cases the asphyxia is so profound that the evidences of life are inappreciable, and cases are reported where infants have been reported dead and laid aside, to revive after considerable time had elapsed, much to the chagrin of the accoucheur, who had omitted making any effort or negligently performed some improvised method of resuscitation. It quite often happens in breech deliveries that animation is suspended, but with proper care vigorous life will soon be made manifest.

The prognosis is unfavorable, both as regards the efforts at resuscitation and the preservation of life afterward, but the success of those who have carefully and skilfully practised the methods of resuscitation has been sufficient to make it obligatory upon every obstetrician to exhaust the resources of science to restore and preserve the life of a stillborn child. The prognosis is less favorable when intra-uterine respiration has taken place, and even more unfavorable when aspiration of liquids and foreign material has occurred.

A diagnosis of the form of asphyxia should be made at once; in fact, in some cases it may be anticipated by a thoughtful consideration of the history of the labor. In such cases hot and cold water and a suitable elastic catheter may be in readiness for immediate use. In the anæmic form the cord should not be tied until the pulsations have ceased; in the apoplectic it should be cut and a drachm or two of blood allowed to escape, care being taken to secure the placental end with a ligature, and to hold the fœtal portion with the thumb and index finger, so as to arrest the flow of blood with the first full cry of the child.

If the ordinary expedients, before referred to, fail to excite respiration—and too much time must not be wasted in such efforts, for they are only of value in cases of delayed or slow respiration—artificial respiration must be established. To accomplish this the mouth and fauces must be cleared of any collection of mucus or other material with the finger wrapped with soft moist linen, and the aspirated fluids must be removed from the air-passages, either by mouth-to-mouth insufflation or by insufflation through a tube or catheter introduced into the larynx. The child's mouth should be wiped dry, and over it a clean towel should be placed; then the obstetrician, after a full inspiration, should apply his mouth and expire slowly and moderately, forcing the air into the child's mouth. Some may enter the large bronchi, but most will escape through the nostrils, thus clearing them of mucus. By gentle pressure with the hand over the sternum or lower latero-anterior region of the chest-walls of the infant expiration will be imitated. By repeating insufflation several times spontaneous inspiration may be excited. This method failing, a flexible catheter or tube may be introduced through the glottis by gently passing it downward behind the epiglottis. By this method the fluids in the lungs may be aspirated and insufflation may be effected. Respiration may be hastened by the simultaneous employment of cutaneous stimuli, such as frictions, flagellation, the application of the hand alternately dipped in hot and cold water, blowing in the face, rubbing the back, sprinkling water upon it, alternately bathing the infant in hot and cold water, or the effusion of the chest or neck with cold water while the body is immersed in warm water. If the infant "is thin, pale (Jacobi), and collapsed, a hot injection into the bowels (104°–108°) will render good service."

Artificial respiration may be established by one of the following procedures:

Byrd's method[1] is simple and easy of accomplishment. It is as follows: "Bring the ulnar sides of the hands together, with the palmar surfaces looking vertically, and prop them beneath the back of the infant, so that the extended thumbs may aid, as far as possible, in sustaining the vertex and inferior extremities; then, keeping the ulnar borders of the hands near together, so as to form a fulcrum, the radial borders or sides are simultaneously depressed to as great extent as practicable—say forty-five degrees—below the horizontal line, and then gradually elevated or pronated to as many degrees above that line, thus facilitating the escape of air drawn into the lungs during the downward movement of the head and chest." These movements should be performed in a regular and gentle manner, and repeated several times. If

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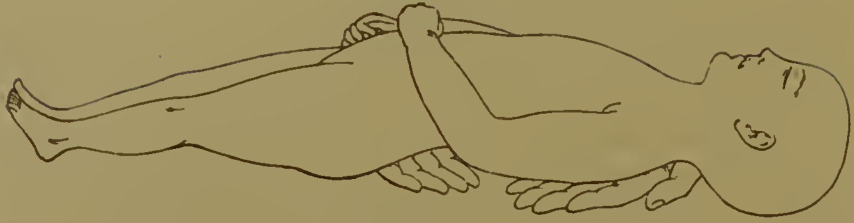
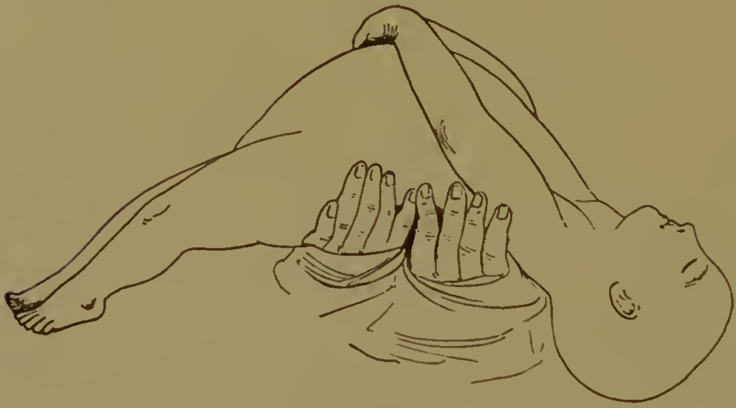
[1] *Obstet. Journ. Great Britain and Ireland*, Supplement, vol. i. p. 65.

FIG. 216.



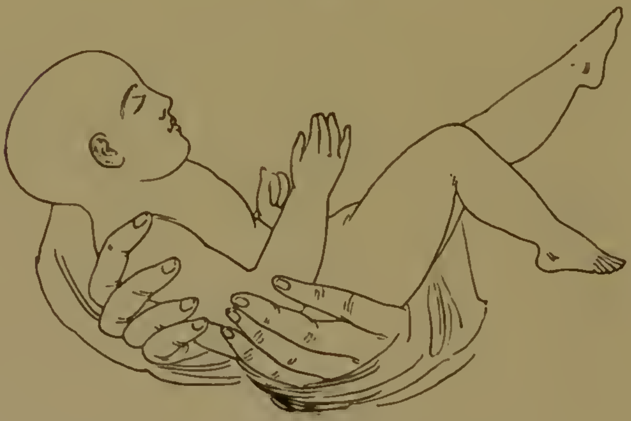
First Position.

FIG. 217.



Second Position.

FIG. 218.



Third Position.

necessary, as will usually be the case, the head should be held by an assistant.

Schultze's[1] method consists in attempts to produce alternate expansion and compression of the lungs by suspension and swinging of the infant. The child is grasped with both hands, with the thumbs resting against the thorax, an index finger in each axilla, and the fingers across the back. It is then suspended, with the face to the front, between the knees of the operator. In this manner elongation and stretching of the chest-walls are produced upward by the traction of the head, and at the base by the falling downward and backward of the lower extremities. The diaphragm is depressed. This elongation of the chest promotes inspiration. Then by swinging the child, by elevating the hands and arms forward above the horizontal line until the body is made to rest upon the thumbs, with the head flexed forward and lower extremities falling forward and downward, the chest is compressed and the aspirated fluid and air are expelled. By repeating these movements at brief intervals mechanical elongation and compression is kept up, which stimulates the movements of inspiration and expiration, and may establish spontaneous respiration. It should be continued until the breathing is full and complete.

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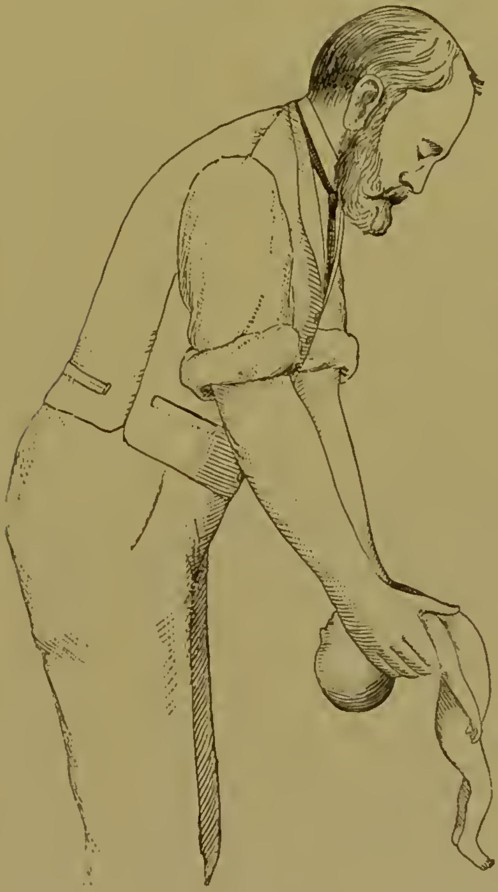
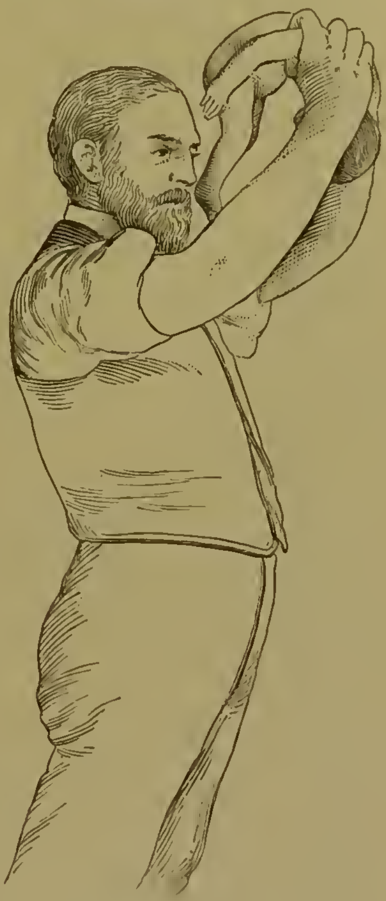
[1] *Der Scheintod Neugeborener*, Jena, 1871, p. 162.

Fig. 219.



First Position.

Fig. 220.



Second Position.

Sylvester's method is simpler than either of the others, and has proven satisfactory in very many cases. It is preferable in cases of very feeble infants, because it involves less exposure and manipulation. The child is warmly wrapped and laid upon its back with the head slightly raised. Then both arms are simultaneously and slowly raised toward and alongside of the head, and then replaced and pressed to the sides to expel the air from the lungs. These movements are repeated until spontaneous respiration takes place or further effort is considered useless.

Goodell promotes the entrance and exit of air by laying the child across his hand, with the head and arms hanging down on one side and the lower limbs on the other. Then with a quick movement he doubles the child up with its chin to its knees. By repeating this folding and unfolding of the child he has succeeded in establishing respiration. When the child gasps he suspends any further effort.

After respiration has been established by either of these procedures the child should be immersed in warm water, then wrapped warmly and kept in a room with the temperature above 70° Fahr. Stimulants may be necessary. It should be carefully watched and nourished until recovery is secure.

Wood resuscitated a child by drawing the entire cord between the thumb and fingers so as to force the blood into the child.

Faradization of the phrenic nerves has also been practised with good results. Jacobi says:[1] "The point of application is near the sterno-cleido-mastoid muscle, over the phrenic nerve. The other pole is applied either to the neck or to the diaphragmatic region or to any other part of the surface. It is best to use large sponge electrodes moistened thoroughly with salt water. The head, arms, and shoulders should be slightly raised. One of the electrodes must be kept stationary, the other brought into contact with the surface but a single moment. A deep inspiration will then take place, the lungs will expand, and lateral pressure must be made on the lower part of the chest to empty the lungs. Another application and the same manipulation must be made and repeated until the baby cries. When coughing occurs, it must be omitted. Continued or too frequent irritation by the current causes over-irritation and paralysis. If the inspirations, after appearing to be fully established, should become superficial, the pulse feeble, and the cyanotic hue return to the lips and finger-nails, some other method must be substituted. The child should be carefully watched for several hours after resuscitation, because the result is not always permanent, and it may be necessary to renew the applications."

The reported cases of resuscitation after the expiration of considerable time, exposure, and sometimes ill-usage of asphyxiated infants suggest the possibility of success under very inauspicious conditions.

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[1] *Archives of Pediatrics*, vol. v. p. 133.

In one case the child had been hidden in a sandpit for half an hour; another had been buried one foot under the surface of the ground for five hours; another was exhumed one hour after burial; another was saved after three-quarters of an hour's burial; and in one case life was discovered in a child twenty-three hours after it had been supposed to be dead and prepared for burial. However incredible these reports may be, they are, nevertheless, instructive, and may show that ill-usage and chilling are not without salutary effects, and may ultimately prove that more careful exposure and refrigeration may be a valuable method of resuscitation.

In this connection the cases recently reported by Goodell are of special interest. In one case the child revived after having been laid aside. The efforts at resuscitation had failed. In another case two physicians had pronounced the infant dead after the failure of several methods to induce respiration. The child was placed outside of the window on the roof, the night being cold. When taken in to be washed it was alive. A third child was laid in the corner of a room after failure of various methods of artificial respiration; an hour later the nurse took it to the bath-room to prepare it for burial and found it alive.

Some observers have claimed better results when the efforts at resuscitation were executed with the child laid naked on the bare floor in a room cooler than the lying-in chamber. The writer has in two apparently hopeless cases succeeded with Sylvester's method in this manner. In both cases the asphyxia was of the anæmic form. Both children are now alive, healthy, and robust.[1]

THE PHYSIOLOGY AND MANAGEMENT OF PUERPERAL CONVALESCENCE.

The puerperal state comprises the period beginning with the completion of the third stage of labor and terminating with the recovery of the patient. During this period the convalescence from the traumata of labor takes place coincidently with the progress of certain retrogressive and developmental processes. The clinical history of the lying-in presents a combination of physiological and pathological phenomena which is necessary to complete the recovery of the woman from the conditions of pregnancy and injuries of parturition and to prepare the organism for the duties of maternity. Processes of waste and repair, of growth and development, are either called into existence or incited to new activities by impregnation and gestation, and each and every organ is invaded by the stimulus of increased assimilation or elimination. The work of organization and construction is carried on, completed, and equipped. The organism charged with such momentous formative energy also provides consentaneously for the consumption and disposal of the débris and of the waste and effete products. All this is accomplished in a limited time, and then the whole abruptly terminates in suffering, attended with more or less violence, and followed immediately by retrogressive and developmental changes. These complex and important processes cannot be defined by any sharp and uniform line of limitation at which the physiological ceases and the pathological begins. The closure of the torn vessels, the involution of the uterus and pelvic tissues, the exfoliation of the decidua, the re-formation of the mucosa, the evolution of the mammary glands, and the secretion of milk present an ensemble of physiological conditions susceptible of easy, and sometimes rapid and insidious, transformation into morbid processes.

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[1] For an elaborate analysis of the methods for reviving asphyxiated children proposed at different times by Hall, Howard, Sylvester, Pacini, Bain, Schücking, Schüller, Schroeder, and Schultze, see *Experimental Researches in Artificial Respiration in Stillborn Children, and Allied Subjects*, Champneys, London, 1887.

The anatomical changes in the blood-vascular and lymphatic systems of the pelvic organs and tissues and the unavoidable traumata of parturition afford easy access for deleterious material. The clinical picture of the puerperal state has no analogue, and in no other condition of human life are the recuperative power and resources so wonderfully and intricately exhibited. But the border-line of normal and healthy conditions is so illy defined, irregular, and easily passed, the onset of disease is often so insidious, and the consequences of delay are so disastrous, that the accoucheur cannot afford to abide the issue of complete development when the diagnosis is plainly exhibited in the picture of a grave disorder threatening immediate danger. He must be on the alert, ready, accurate, and self-reliant.

Labor involves effort, consumption of strength, loss of weight and fluid, and is followed by more or less exhaustion, thirst, and desire for rest and sleep. Usually, after the patient has been comfortably arranged in bed and the chamber is darkened and quiet, she will sleep. If disturbed by any nervous excitement or anxiety concerning the condition of the child, she should be admonished that repose and sleep are necessary, and every cause of apprehension should be removed by such assurances of safety to herself and infant as can be conscientiously given. In many cases she will complain of chilliness, sometimes associated with marked shivering, without any elevation of temperature or disturbance of the pulse. The chills are attributable to exhaustion, cooling of the surface, depletion from loss of fluids by sweating, and diminution of intra-abdominal pressure in consequence of the removal of the pressure of the pregnant womb. They demand no special treatment, and soon subside.

During labor the pulse rises, being more frequent during the pains than during the intermissions. After delivery it rapidly subsides, falling during the succeeding twelve hours below the normal, and sometimes continuing so for some days, in rare instances oscillating between forty and fifty. No satisfactory explanation for this post-partum slowing of the pulse-rate has been offered, but it is generally regarded as a favorable symptom. On the contrary, when the pulse rises after delivery and reaches 120 during the first or second succeeding hour, it is ominous of hemorrhage. In such cases every precaution should be taken to avoid the impending danger. The accoucheur should not absent himself until assured that the crisis is past.

The temperature of a woman in labor always rises above normal. In ordinary natural labors the elevation is insignificant, but it may continue above the normal for some hours after delivery. In most cases the temperature falls to normal, and in rare cases slightly below, during the first twenty-four hours. Before the introduction of antisepsis in midwifery another and more marked elevation was always expected toward the close of the third or beginning of the fourth day, usually denominated the "milk fever." Those who diligently and intelligently practise antisepsis during the puerperal state do not expect any febrile movement, and are surprised at an elevation above the so-called physiological limit of 100.5°.

In rare cases, more especially in multiparæ, after-pains are very troublesome, but if care has been taken to secure firm contraction of the uterus and to expel any clots forming during the hour succeeding labor by firmly compressing the organ after the method of Credé, such pains will not often harass the patient. It is held by some that such post-partum contractions are salutary, conducive to the condensation and involution of the uterus and expulsion of the clots. It is not improbable, however, that the contractions are excited by the presence of the clots. The reflex contractions occurring during the suckling of the infant are certainly physiological, but the ordinary clinician will probably continue to class the "after-pains," as usually seen, as pathological phenomena amenable to medication. If such pains recur at short intervals and are associated with a rise of the temperature, some inflammatory complications may be anticipated. As a rule, the "after-pains" will be relieved with a moderate dose of the sulphate of morphia dissolved in half an ounce of camphor-water, with ten or twenty grains of the bromide of potassium.

Retention of urine during the first and second days is a very common and troublesome complication, especially among the primiparæ in the higher walks of society. It seems to have become a fashion among this class of females to refuse to make any attempt and to resist any inclination to evacuate the bladder for several days after confinement. It is a nervous condition, induced by the sensation of localized soreness and fear of being hurt. In such cases micturition may be effected by bathing the external genitalia with warm water or by administering a hot-water vaginal douche, or by the more æsthetic expedient of pouring water in an attenuated stream from one vessel to another, so as to be heard and seen by the patient. If these efforts fail, the catheter must be employed. In some cases retention of urine is something more than a nervous phenomenon. The bladder may have been paralyzed by distension, the urethra may have been contused during the labor, or the meatus may be occluded. The structure of the urethra may be swelled and infiltrated and the channel obliterated by congestion and swelling of its mucous lining. Such cases can only be relieved by the employment of the catheter, a soft and flexible one being preferable. Great care should be taken to make the instrument aseptic, and its introduction should be executed with gentleness, or unnecessary pain may be produced. The bladder should be evacuated every eight hours, and oftener if necessary.

The loss of weight during labor is estimated at one-ninth, due to evacuation of the womb, loss of blood, and to increased exhalations from the lungs and skin. This loss continues during the first week of the puerperium, and is attributed to the lessened amount of food taken, lochial discharge, increased secretion of urine, continual increased pulmonary and cutaneous exhalations, and to the secretion of milk. The total estimated loss during labor and the puerperium amounts to *one-fifth*[1] of the whole weight of the body at the advent of labor. During the later weeks of the woman's convalescence she begins to regain weight, but in a large proportion of cases the entire loss is not restored until the period of lactation has terminated. This is more often the case with primiparæ than multiparæ.

INVOLUTION OF THE UTERUS.—The retrogressive changes by which the uterus is restored to its condition previous to pregnancy begin with the advent of labor. The processes of involution involve destruction and reparation. While the muscular fibres and cells which have completed the purposes of growth and development are undergoing fatty degeneration and absorption, new cells and new formations make their appearance. By these changes the organ continuously loses in size and weight; the walls diminish in thickness, but increase in density. A womb which weighed more than two pounds immediately after labor will not weigh more than three-fourths of a pound at the beginning of the third week, and usually at the close of the sixth week the process is completed; but the uterus never resumes the size and shape of a nulliparous organ.

THE CERVIX.—After delivery the cervix is elongated, soft, pulpy, and gaping, but the process of involution proceeds rapidly. At the end of twelve hours the cervix is well defined and the internal os is contracted to about two fingers' breadth. In ten or twelve days the cervix is reduced to about one inch in length; the internal os will not admit a finger, but the external os remains patulous. The os tincæ never resumes its virgin shape and size, but remains enlarged transversely, marked by a lateral depression, with thickened anterior lip. If laceration has occurred it may gape, with rolling out of the labia.

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[1] Gassner and Hecker found a diminution of one-twelfth.

CLOSURE OF THE SINUSES.—It is generally taught that during the eighth month of pregnancy some of the uterine sinuses are obliterated by the coagulation of blood. After delivery thrombi are formed in the open sinuses. These thrombi undergo organization, and by gradual shrinkage the sinuses are completely obliterated, but the process is not completed until the fifth month after labor.

Some of the arteries are destroyed by compression of the muscular structure, and their walls undergo fatty degeneration and absorption. Others are diminished in calibre by uterine involution, and remain.

THE VAGINA.—The vagina after delivery is very large, with relaxed and soft walls. Involution proceeds gradually during the period of puerperal convalescence, but the vagina never returns to the size and condition of that of a woman who has never given birth to a child.

RE-FORMATION OF THE MUCOUS MEMBRANE.—The re-formation of the mucous membrane proceeds with the progress of involution. The outer or superficial layer of the decidua is mostly detached and expelled with the placenta and secundines, but fragments remain attached to the inner layer, which latter consists mostly of the fundi of the glands. The fundal extremities of the glands are lined with epithelium. As involution proceeds the adherent fragments of the outer layer exfoliate and are discharged with the lochia. With progressive condensation of the uterine tissues the glands are pressed closely together and forced into a perpendicular direction. Proliferation of the epithelial lining of the glands takes place, and extends along the gland-walls to the surface of the uterus. From these numerous gland-foci, by continuous extension and growth, the mucous lining of the organ is completely re-formed. This process is completed at the end of the fifth week, and the inner surface of the uterus is completely reinvested with a new mucous membrane. At the placental site the process of regeneration is slower than at other parts of the uterine surface.

THE LOCHIA.—The lochia is the discharge following delivery. At first it is red and consists of blood, but in the course of a few hours it will usually contain also bits of decidua, and perhaps small fragments of the placenta and membranes, together with the secretions from the cervix and vagina. For the first two or three days, whilst red and consisting mostly of blood and the exfoliated débris, it is known as the lochia rubra, but with the diminution of the blood and the increased serous exudation from the inner surface of the uterus, which takes place during the third, fourth, and fifth days, the red color is gradually lessened and the discharge becomes sero-sanguinolent in character, known as the lochia serosa. The quantity of blood-elements continues to decrease, but the pus-cells, fat-granules, free fat, epithelial cells, and crystals of cholesterin increase until it assumes, during the second week, a grayish or yellowish color and creamy consistency, distinguished as the lochia alba. It continues to diminish in quantity, loses opacity and consistency, and ceases between the second and fourth weeks. The discharge is alkaline at first, then neutral or acid. If the patient rises from her bed too soon or makes too much effort, there is apt to be some return of a red show; or if she fail to nurse the infant, the quantity and duration of the discharge may vary from the ordinary course. Primiparæ have less flow than multiparæ. The quantity of lochial discharge during a natural puerperium is estimated at three and a quarter pounds. After the first few days there may be some odor, but if rigid cleanliness is observed and antisepsis diligently practised, there will not be any fetor. In some cases the discharge is diminished during the establishment of the mammary secretion.[1]

POSITION AND SIZE OF THE UTERUS.—After the delivery of the placenta and secundines, and after firm contraction has been secured, the uterus can be felt as a firm hard mass, pyriform in shape, above the symphysis pubis. It is somewhat anteflexed, with the fundus directed toward the abdominal walls; measures in width about four and a half inches, and in length, by the sound, about six inches. If the patient is in the recumbent posture, with each hip on the same level, it will rest in the median line, but if the rectum is distended with fæces or the bladder full of urine, it may be pushed to the right side. The womb is not so large after first as after subsequent labors. During the first twenty-four hours the fundus will reach the navel. As involution proceeds it descends, and about the tenth day it will be slightly above or on a level with the symphysis. If any enlargement takes place, it is due to some morbid condition, but care must be taken to exclude displacement caused by a distended rectum or bladder.

THE CHANGES IN THE MAMMARY GLANDS.—The changes which take place in the mammary glands are developmental. Milk is the natural aliment of young animals. Maternal lactation is the natural method of supplying it to the infant. The secretion of milk is the ultimate product of those changes in the glands which begin with pregnancy and are completed during the earlier days of the puerperium. Lactation begins with the birth of the offspring and continues for an indefinite period. The function is not suddenly established. The periodical evolution of the breasts corresponds with the progress of pregnancy. Both processes are gradual. No other organs in the body, except the uterus and ovaries, are subjected to similar periodical changes. The processes of periodical evolution and involution are in inverted parallelism. The former is as necessary to promote the secretion of milk as the latter is to restore the gland to a normal quiescent condition—to await rehabilitation and renewed functional activity with a succeeding pregnancy.

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[1] Micro-organisms are constantly found in the lochial discharge, but in a strictly normal case they should not be pathogenic. In the vaginal secretion is found the infusorium Trichomonas vaginalis.

The gland structure is composed of lobes, lobules, and acini. These, with the lymphatic structures, constitute the secretory apparatus of the mammary glands. The canaliculi of the acini unite and form the canals of the lobules, and by anastomoses of these canals the lactiferous ducts are formed. The ducts terminate in the nipple by openings varying in size from one-sixteenth to one-fortieth of an inch. As the ducts approach the nipple their calibre is very much enlarged, so that they resemble an elongated sinus, but is again diminished to about one-twenty-fifth of an inch in that part which penetrates the nipple. The interlobar spaces are filled with fatty tissue, and the whole mass of the gland is held together by connective tissue and covered by smooth soft skin with an underlying layer of adipose tissue.

The secretion of the glands prior to labor and during the first three or four days of the puerperium is known as colostrum.[1] It is a yellowish fluid composed of fat, sugar, albumen, water, and salts, and is supposed by some to possess laxative properties. In this viscid fluid is suspended free oil-globules and masses filled with oil-globules known as colostrum-corpuscles. Colostrum possesses an alkaline reaction and contains about 17 per cent. of solid matter.

Colostrum is replaced by milk, usually in three or four days, though occasionally the change is delayed for several days. Milk is a liquid composed of a fluid transudation from the blood and contains products of gland-secretion. It contains from 2 to 7.6 per cent. of butter, from 3 to 6 per cent. of milk-sugar, casein, water, and salts. It is a more digestible fluid than colostrum, with a higher percentage of water and less of solid matter.[2]

MILK FEVER.—In times past it was generally believed that the occurrence of fever during the establishment of the secretion of milk was an unavoidable interruption of puerperal convalescence. Only the exceptional few escaped. Now the reverse is known to be true. This marked and salutary change in the ordinary condition of the lying-in is undoubtedly due to the more careful management of puerperal convalescence and the observance of antisepsis. In rare cases toward the close of the second day, but more frequently a day or two later, the breasts become turgid, sensitive, and more or less firm, occasionally associated with some tenderness of the axillary glands. There may be present a sense of general discomfort, some restlessness, more or less impairment of the appetite, a moderate rise of the temperature, and slight increase in the pulse-rate. The ordinary physiological limit of 100.5° of temperature is too high. This has been very clearly shown by the recent observations in maternity hospitals and private practice. In those cases of temperature elevation to or above 100.5° such rise is the result usually of either neglect of antisepsis, indiscretion in diet, loss of sleep and rest, incomplete evacuation of the bowels, or some nervous perturbation. There is another class of patients in which fever occurs, the temperature rising two or more degrees above the so-called limit, preceded by a well-marked chill. In such cases the functional evolution of the glands has been interrupted by retention of the secretions or by improper handling of the breasts, due either to some defect or condition of the nipples which makes nursing painful, or to disinclination or refusal of the mother to submit to the painful annoyance of nursing, or perhaps to some condition of the infant which incapacitates it for nursing. It is not possible by any method of treatment or management to avoid the discomforts which are necessarily associated with the tension, fulness, and tenderness of the mammary glands during the period of complete functional evolution; but a rise of temperature to 100.5° is not a necessary concomitant, and may be avoided in much the larger number of puerperæ. Proper preparatory treatment of the nipple, especially among primiparæ, and the prevention of fissures and cracks during the first two or three days after confinement, are important and essential protectives against temperature elevation.

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[1] The milk-secretion resembles the secretion of sebaceous matter and seminal fluid. It is a process of cell-proliferation and cell-degeneration. The epithelial cells in the glands proliferate, are infiltrated with fat-globules, and ultimately perish. By their disintegration the fat-globules are set free. "A colostrum-corpuscle is the still coherent globule which results from the fatty metamorphosis of an epithelial cell" (Barnes).

[2] The quantity of milk is about 400–500 grammes on the seventh day. After the second week it reaches 1500–2000 grammes.

Diagnosis of the Puerperal State.—The diagnosis of recent puerperality ought to be readily made by the size, position, and condition of the uterus; the color, quantity, and character of the lochial discharge; the enlarged and lax condition of the vagina; the development of the mammary glands and the presence of colostrum; the condition and appearance of the abdominal walls; and by the general loss of weight. The external os is open, and the cavity of the cervix is elongated, with gradual diminution toward the internal os. The os tincæ is usually torn at its lateral margins, and perhaps deeper into the structure. The perineum is relaxed, contused, somewhat swollen by infiltration, and more or less lacerated along the median line. The tissues of the vulva are soft and flabby, with abrasions on the mucous surface and tears at the orifice. The fourchette is most usually torn. Deep and extensive lacerations may be present, either involving all the tissues of the perineum or limited to the mucous membrane. The nipples are erect, tender, and surrounded by well-marked and deeply-colored areolæ. The later stages of convalescence are characterized by the gradual subsidence and disappearance of these conditions. The involution of the uterus is marked by continuous and gradual diminution of the uterine tumor, changes in the color and character of the lochia, healing of the slight tears in the utero-genital tract, contraction of the internal os, continuous lessening of the cervix in length and size, and gradual diminution of the capacity of the vagina. The replacement of the colostrum by the establishment of the milk fixes the period of complete functional evolution of the breasts. All these changes take place with comparative regularity, and are marked by appearances sufficiently defined to indicate the period of convalescence.

The directions in regard to the care of the patient and infant during the earlier hours of the puerperal state having been given in the sections relating to the management of the third stage of labor and the period immediately succeeding (see p. 505), it remains to consider the after-treatment of her convalescence and the proper attentions to the child. This involves such methods, means, and conduct as will protect her from complications and accidents, promote progressive improvement and final recovery from the conditions and injuries of parturition, and secure the healthy growth and development of the child. If such directions have been faithfully and intelligently carried out, the accoucheur at his first visit will usually find the patient refreshed by rest, sleep, and food, with a normal pulse, perhaps slightly subnormal temperature, free from pain, quiet in mind, resigned to the unavoidable discomforts of her condition, and enthusiastic with the awakened pleasures of maternity.

First Visit.—The first visit should be made during the succeeding twelve hours, and sooner if the conduct of the labor has excited any suspicion of unsatisfactory progress; and it will usually prove wise to make a second visit during the twenty-four hours succeeding delivery. At the first visit the accoucheur should, by careful inquiries, ascertain the exact condition of the patient—the duration and character of sleep, and, if interrupted, the cause; the presence or absence of pain; the amount of lochial discharge; the state of the bladder, the pulse, and the temperature; the amount and character of the food and drink taken; the condition of the breasts and nipples; and the extent and degree of abdominal tenderness. He should take nothing for granted, but verify every statement of the nurse by personal inspection and examination. Such minute and careful investigation will often save trouble and avoid disagreeable interruptions of convalescence. If the patient's condition is satisfactory, the visit should terminate with such explicit and positive directions as his judgment may approve. Subsequent visits should be made daily for a week, or longer if necessary, and after the first week a visit once a week during the puerperal month will be judicious.

Evacuation of the Bladder.—The bladder should be evacuated at least once every eight hours. If the nurse is competent and the simple expedients before referred to fail, the employment of the catheter may be entrusted to her; but no loose and indefinite statements in regard to the quantity of urine voluntarily passed or drawn off should be accepted to avoid the disagreeable duty of its introduction. It is never wise to permit the patient during the first three or four days of the puerperium to sit upright on a commode to empty the bladder. If her prejudice against the use of the bedpan or inability to pass water in the recumbent posture is insurmountable, the employment of the catheter is preferable to the effort necessary to assume the sitting posture on the commode. The instrument should be employed without exposing the person of the patient, which can be easily accomplished by ascertaining the location of the meatus with the index finger of the left hand and gently inserting the beak of the instrument, and slowly pushing it along the urethra until the urine is discharging at the other end into the vessel in readiness. When the evacuation has been completed the end of the instrument should be closed with the finger to prevent dripping, and it should be slowly withdrawn. Before its introduction the parts should be gently bathed with tepid water to avoid the possibility of causing cystitis by the introduction of foreign matter, and special care should be taken to make the instrument aseptic. Catheters in common use by the most intelligent nurses need special care in this regard.

Food.—Previous to the evacuation of the bowels—that is, during the first three or four days, the patient should be confined to a liquid diet of such easily digestible and nutritious aliments as may best suit her taste and caprices, such as milk, animal broths, chicken broth, and gruel. In some cases bread thinly sliced and dried in an oven, milk toast, or corn-meal mush and milk may be allowed. Tea and coffee are not inadmissible. Some food should be taken at intervals of three or four hours during the waking hours. Lying-in women need food to replenish waste, to restore strength, and to meet the demands of milk-production. Whilst care should be taken to avoid starvation, equal care is demanded to escape overfeeding and consequent digestive disturbances. After the bowels have been thoroughly evacuated a more generous diet may be allowed—at first, lamb chops, soft-boiled eggs, birds, tender beefsteak, with bread, properly cooked potatoes, or homing. Fresh vegetables, acescent fruits, desserts, rich condiments, and the entire list of candies, sweetmeats, and bonbons, should be interdicted during the time the patient is confined to the bed. As the convalescence progresses and the patient has acquired strength sufficient to sit up and to concern herself in the ordinary duties incident to recovery from labor, she may gradually resume her accustomed diet, avoiding excesses and indulgences which disturb digestion and unfit her for the proper discharge of the duties of maternity.

Attention to the Bowels.—The routine practice of moving the bowels on the third day is a good one, but it is not an inflexible law. In this as in other details pertaining to the management of the puerperium intelligent discretion will often prove wiser than blind adherence to fixed rules. A foul tongue, headache, and alimentary disturbance will sometimes make an earlier evacuation of the bowels necessary. The writer has recently witnessed a very severe cholera morbus occurring twelve hours after labor at the eighth month in a patient who had dined the previous day on canned corn and sweet potatoes, without detriment or other interruption of her convalescence. The laxative should be selected with reference to the habits and peculiarities of the patient. That which she may have habitually used is usually preferable. The compound licorice powder, made after the German formula; the compound rhubarb pill, a combination of calcined magnesia and blue mass; the Friederichshall and Hathorn waters or some saline aperient,—will fulfil the indications. A half-ounce dose of castor oil is not without merit. A better plan is to administer the night of the second or third day a small clyster composed of equal parts of tepid water and olive oil, or four or five ounces of tepid water and one or two ounces of castor oil with the yelk of an egg, or the same quantity of tepid water and an ounce of glycerin. Such enemas will be retained for considerable time, and usually produce a free evacuation early during the succeeding day. If the bowels are not sufficiently evacuated during the succeeding day, give the next night some laxative by the mouth. A proper dietary will often secure movement of the bowels, and if any necessity for immediate evacuation should occur an active enema will best meet the indication. Daily evacuation of the bowels is very desirable, but circumstances must be considered. The continuous use of purgatives without allowing opportunity for spontaneous movements to occur is not prudent.

Sleep.—The importance of sufficient sleep should be impressed upon the patient. Her anxieties concerning the infant should be quieted. The child should be taught to respect the necessities of the mother, and as soon as practicable it should be nursed at a fixed hour at night and put to sleep, so that the mother can rest undisturbed for six consecutive hours. This can be easily accomplished by systematic training of the infant, and no palaver of the nurse, protestation of the mother, or interference of idle and intermeddling friends and over-zealous and anxious grandmothers should be permitted to interrupt this simple but important rule of practice.

Posture in Bed.—Continuous dorsal decubitus is tiresome and unnecessary. If permitted, the patient will usually seek the posture most comfortable to her. Change of posture is restful. If the binder is properly adjusted and kept in place, the uterus will not roll from side to side as the patient changes position. When not contraindicated, after the first four or five days a semi-recumbent posture may be allowed at pleasure.

Attention to the Lochia and Cleanliness.—Antiseptic midwifery demands the utmost cleanliness. The poison of puerperal septicæmia either originates from the decomposition of coagula, lochial discharge, or the presence of other organic matter resulting from the labor, or is conveyed to the patient by the accoucheur or nurse or by the atmosphere of the room. There may not be as much renown in preventing as in curing septicæmia, but there is infinitely more satisfaction to the conscientious obstetrician. Cleanliness is the first law of prevention—cleanliness of the person and clothing of the patient, of the bed and bed-clothing, of the room, and of the appurtenances and utensils of the lying-in chamber. The discharges and the vessels and clothing containing them should be removed; so also wash-water, wash-rags, soiled towels, and all unclean things. Vaginal pipes, enema-tubes, catheters, and all other instruments and appliances must be kept scrupulously clean.

The progressive changes which take place in the color and character of the lochia have been described. It is not equally abundant in all women, but is supposed to vary in quantity according to their menstrual history. If too profuse or too long continued, ergot may be employed either by the mouth or in the form of rectal suppositories made of the aqueous extract, or ergotin may be used hypodermatically.

During the continuance of the lochia napkins or pads made of some soft and cheap material should be kept in position to receive the discharges and protect the clothing of the patient and the bed-linen from soiling. Such napkins or pads should be burned after being used. Garrigues' antiseptic pad or some modification made of equally soft and absorbing material will fulfil the requirements of neatness, softness, cheapness, cleanliness, and convenience. After the removal of each and every pad, and after each evacuation of the bladder and bowels, the parts should be gently washed with tepid water and then bathed with some antiseptic fluid.[1] Every pad or napkin should be sprinkled with the same fluid before its application. A warm vaginal douche should be given twice daily during the first week; in occasional cases one would prove sufficient. The fluid for the douche should be prepared as described in the note, but double the quantity of carbolic acid may be used, or a bichloride solution, varying in strength from 1 to 2000, 3000, or 4000, may be preferable. A Davidson's syringe with a hard-rubber nozzle is better than a fountain syringe. The beak of the nozzle should be smooth, with openings around its circumference and none at the centre of the end. The nozzle should be introduced so that the end is well up in front or behind the cervix. It is barely possible to avoid the entrance of some fluid into the cavity of the womb previous to the contraction of the internal os, but such care should at least be taken as to avoid thrusting the nozzle into the cervix. The writer has witnessed two cases of very severe uterine colic, followed by a terrific febrile explosion, resulting from improper and careless employment of the syringe. In one case the lady, in a fit of passion, seized the instrument and thrust the nozzle into the cavity of the womb; in the other case the nurse introduced the end of the nozzle just within the introitus vaginæ. It is possible—in fact, very probable—that during the earlier days of the puerperium, when the cervix is expanded and the internal os widely open, that a portion of the fluid injected may enter the cavity of the uterus; but if the instrument is properly used the fluid can only enter by its own pressure, and will flow out with the escape of the fluid from the vagina. A bedpan should be so placed as to favor free exit of the fluid from the vagina. Such gradual entrance and free escape of a portion of the fluid from the cavity of the uterus is not believed to be detrimental. It is only in those cases where the fluid is forced by a direct stream or its escape is obstructed and accumulation follows that injury is inflicted. In those cases where the writer has felt compelled to use hot water intra-uterine injections immediately after delivery the "getting up" of the patient has been undisturbed.

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[1] Such a fluid may be prepared by mixing one ounce of liquid carbolic acid with seven ounces of glycerin. Mix one half ounce of this preparation with one quart of warm water when needed for use.

Sanitation and Police of the Chamber.—Sanitation of the chamber during the puerperium is equally if not more important than during labor, and the rules for and methods of ventilation and protection from contaminating effluvia before referred to are equally applicable and should be observed with even greater care. The shutting up of a parturient woman in a dark room, with the blinds, doors, and transoms closed, and the windows and doorways hidden by curtains and portières, may be æsthetic, but certainly is not conducive to convalescence. During the sleeping hours or when quiet and rest are needed a darkened room may not be inappropriate, but fresh and pure air, of suitable temperature, and plenty of sunlight, have not often retarded recovery from parturition.

The room should be kept quiet. The intrusion of gabbling visitors, whose chief avocation in life is to picture the precise resemblance of the patient's ailments or discomforts to those of some dead or dying friend, should be prohibited; in fact, during the first week it will prove wisest to exclude all persons except the necessary attendants and the husband. Nor should those whose presence may be necessary engage the patient in loud and noisy conversation or weary her with unnecessary and idle details of current events. Nor should her quiet, rest, and sleep be disturbed by noise in the dwelling. If the mother is disturbed by the cries of the infant, it should be removed to an adjoining room.

Nursing and Care of the Breasts.—The nursing of one's offspring is the highest privilege and duty of maternity. No woman who refuses to discharge, or deliberately incapacitates herself for, this duty can fulfil the obligations of a mother. Only those who may be unfitted by physical disability can be excused. It will, however, occasionally become the duty of the obstetrician to deprive an affectionate and dutiful mother of the coveted privilege because of bodily affliction which unfits her for lactation or makes it detrimental to the infant. Mothers suffering from phthisis, epilepsy, or syphilis should not nurse their babies. Social and society demands should not excuse a mother. A woman who cannot or will not forego the ephemeral pleasures and pastimes of society should eke out her life as a barren spinster.

The child should be nursed not later than three hours after the completion of labor, unless the mother should be asleep, and then upon awakening. It is sometimes judicious to put the infant to the breast before leaving the house. Nursing excites contraction of the womb, and the earlier the attempt is made the more certain the effect. This circumstance may prove an important therapeutic agent in promoting and securing firm and persistent uterine contraction. During the puerperal month the infant should be nursed every two hours during the day, but not oftener than once in three hours during the night. As soon as practicable—and that will usually be during the second week—the intervals at night should be lengthened, so that the mother may secure six hours of undisturbed sleep. But rarely will there be difficulty in getting the baby to seize the nipple; usually it will do so with great eagerness, and, though the supply of nutriment is very small until the milk-secretion is established, it is usually sufficient and all that need be supplied until Nature has begun to produce the child's natural aliment in ample quantity and its organs are prepared for the higher functions of digestion. Attempts at artificial feeding before the establishment of the milk-supply usually resolve themselves into attacks of colic and screaming spells, which expose the wilful interference of the nurse and clandestine feeding.

The nipples should be carefully bathed with tepid water before and after nursing, and dried with a soft cloth. If tender, cracked, or fissured, they should be pencilled after each nursing with the compound tincture of benzoin, which should be thoroughly removed before the child is again nursed. Careful attention to these details will frequently obviate more serious complications, for puerperal mastitis most often finds its cause and beginning in neglected cracks or fissures. Sometimes, especially in primiparæ, lactation is impossible because of the pain produced by suction, and it becomes necessary to protect the nipples with a shield. The best is that known as the Phœnix nipple protector, which is supplied with or without a tube.

The breasts should be nursed alternately, and during the intervals should be protected from exposure and the irritation of the clothing by some soft material smoothly laid over them. If heavy, tender, and pendulous, they may be supported by a bandage smoothly adjusted and fastened over the opposite shoulder. Soreness of the breasts with threatening mastitis may be allayed by the application of a saturnine lotion. Such a lotion may be prepared by dissolving one drachm of the acetate of lead in one pint of water, to which may be added one or two drachms of laudanum or the deodorized tincture of opium. The breast must be completely enveloped with a piece of soft linen or cotton cloth, with a hole in the centre through which the nipple can protrude, and saturated with the lotion. It can be kept moist by sprinkling it with the lotion while in position. Before nursing the cloth must be removed and the breast carefully washed to avoid the danger of poisoning the infant with lead or opium.

If, as is always proper with primiparæ, the nipples have been subjected to preparatory treatment, trouble does not often occur. The local treatment involves the management of the gland and nipples before and after labor. Any disease of the gland or irregularity in shape or position of the nipple should receive the necessary attention before or during pregnancy. Sore nipples and sore breasts are quite common, and sometimes unavoidable, occurrences after confinement; but with proper care and timely treatment they are usually manageable affections, and do not necessarily permanently disturb the function of the gland. The preparatory treatment of the nipple consists mainly in promoting its projection, size, and form by drawing it out daily with the thumb and fore finger, and hardening the epidermis with daily applications of an astringent alcoholic solution. The treatment of inflammatory complications and malformations of the gland belongs more properly to the article on the Pathology of the Puerperal State, to which the reader is referred.

Duration of Puerperal Convalescence.—By common consent the period of puerperal convalescence is limited to thirty days. The custom of remaining in the house and refraining from household duties is so generally and voluntarily observed by women that it may be considered a law. There are many good reasons for this practice. During this period involution of the uterus takes place, and in a majority of cases is completed before its expiration. The patient regains strength and vigor and becomes accustomed to the routine duties of nursing and care of the infant. It is not, however, necessary for her to remain in bed. There is a common belief among women that they must remain in bed during the first nine days. This is the one of the superstitions which is of practical value, because it secures physical rest and mental quietude during the most important period of convalescence, and restrains importunities for permission to do things which are considered wrong or of doubtful propriety. The duration of confinement to the bed varies. Some practitioners hasten the getting up, and others delay it. Neither extreme is wise. As a rule, those who remain in bed during the first ten or fourteen days are in a better condition at the expiration of the puerperal month than those who abandon it at an earlier period. In his early professional life the writer followed the teachings of Hodge and Warrington, but later, when the journals were teeming with the salutary effects of a radical departure from these old-fashioned ideas, and enforced sitting up during the later days of, or at most at the expiration of, the first week was insisted upon, he accepted and practised the procedure. For a time the results seemed to demonstrate its wisdom and utility, but a few sad experiences called a halt, and he resumed the earlier method, the wisdom of which has been confirmed by more careful observation and later and more extensive experience.

Attention to the Child.—During the first visit after the delivery the obstetrician should inquire into the condition of the infant. As a rule, he will learn that the bladder has been evacuated and that one or more discharges of meconium have taken place. Sometimes the passing of water and movement of the bowels will be delayed; but if the child is quiet, sleeps and breathes without disturbance, such delay for a few hours need occasion no alarm nor will it be necessary to administer drugs or potions. The food obtained by nursing will prove sufficient.

The caput succedaneum will subside and disappear in twenty-four hours. The head will slowly resume its normal shape. Exfoliation of the epidermis usually begins about the third day, and is completed at the expiration of a week. The deep red color of the integument fades, passing into a yellowish hue. The stools change from black to yellowish, and become feculent. During the first three or four days the child loses in weight, but as soon as the evolution of the mammary secretion is completed and sufficient nutriment is supplied it begins to regain weight, and usually at the expiration of the first week it has regained the lost weight.

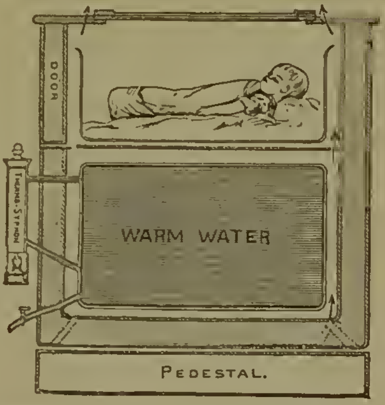
The cord falls off in four or five days, leaving a raw surface, which should be washed and dusted with the subnitrate of bismuth or dressed with carbolized ointment. It should be carefully watched until entirely healed.

Icterus neonatorum is a rare affection in private practice among the infants of well-to-do people in this country. It usually attacks the child during the first day or two, and disappears spontaneously in a week. It most frequently occurs in premature and feeble infants and in those subjected to bad hygienic surroundings. Medication is unnecessary and often detrimental.

Nurslings should not be allowed to continue at the breast when asleep, but should be removed as soon as they have finished, nor should they be permitted to remain in the same bed with the mother. A properly prepared and conveniently arranged crib is the proper resting- and sleeping-place for the newborn. It is equally improper to permit the nurse to hold the baby on her lap except when performing some necessary duty. All unnecessary handling and coddling of babies brings trouble. A properly fed and sleeping baby is a well baby; a crying and colicky baby is one that is poorly nourished, badly or improperly fed, or dosed with teas or medicines.

Feeble and premature infants need special care. Tarnier's success with the "hatching-cradle" has demonstrated the importance of proper management of weak and immature infants. The incubator consists of a wooden box with walls 0.10 to 0.12 centimeter thick, filled in with sawdust to prevent loss of heat. A central partition divides the box into two compartments, the one for hot water, the other for the infant's cradle. A metal case, of a capacity of about 71 liters, fits into the lower compartment, leaving a space of 2 to 3 centimeters between its walls and those of the box for the free circulation of air from below upward. The capacity of the upper compartment is about 86 cubic centimeters; there is free circulation of air between it and the lower compartment, and it is in communication with the outer air by means of two openings—the one on its upper surface shut in by a double plate of glass, the other, laterally, opening like a door and allowing exit to the cradle. In each corner of this upper compartment is a hole for the escape of the heated air from below. To the lower compartment, containing the hot water, is attached a thermosyphon by an upper and a lower tube. When the lamp under this siphon is lighted, the heated water flows through the upper tube into

FIG. 221.



Section of Tarnier's Hatching-cradle.

the chamber, displacing an equal amount of water, which flows back to the siphon. Thus a current is established the temperature of which can be raised to the desired point. In cold weather it has been found necessary to light the lamp three times daily, allowing it to burn each time about two hours. The lamp should be extinguished when the temperature in the upper compartment is about two degrees above the heat desired. The registering thermometer may be laid alongside the infant.[1]

But every accoucheur cannot be supplied with the apparatus. Artificial heat and well-regulated alimentation are the resources of successful management. In all such cases the mother's milk is the best food. If the infant cannot grasp the nipple or is too feeble to suck, the milk must be drawn from the breast and fed to it. If the supply is insufficient or entirely absent, the milk of some animal, preferably that of the cow, properly diluted and prepared, must be substituted. The ordinary management of such cases may be illustrated by the following reports of two cases:

A lady having been greatly frightened by a thunderstorm during a heated term in July was prematurely confined at the sixth and a half month. The infant, without being washed or dressed, was immediately and securely wrapped in cotton wool, so arranged about the face as to prevent any obstacle to respiration and to afford easy access to the mouth. The father took charge of, and devoted himself assiduously to, its care. The secretion was drawn from the mother's breast by suction with a pump and gentle pressure, and fed regularly, at brief intervals, to the infant by means of a dropper. This is a glass tube slightly curved at the beak, with a small elastic bulb attached to the other end. The whole apparatus when full holds about twenty minims of fluid. The infant is fed by gently introducing the beak of the instrument into the mouth with the end well down toward the base of the tongue, and then by gentle pressure of the bulb between the thumb and index finger, intermitting or not as may seem best, the fluid is slowly forced out and swallowed by the infant. The quantity of food supplied in the case cited was increased from day to day as the gland secretion became more abundant. At the expiration of three weeks the child was washed and dressed. She is now a healthy and vigorous girl twelve years of age.

The second case was a feeble infant weighing one and three-fourths pounds, born at term. It could not be made to grasp the nipple, nor could anything be obtained from the breast. The baby was washed and dressed as best could be done with such a flaccid, relaxed, and emaciated body. During the first twenty-four hours two minims of brandy in a dropperful of warm water was administered regularly every two hours. Afterward, for several succeeding days, in addition to the brandy it was fed by the dropper with a warm solution of condensed milk, made in the proportion of one part of milk to sixteen of warm water, beginning with a dropperful every hour, and gradually increasing the quantity and prolonging the interval until the child, at the expiration of the first week, had gained sufficient strength to omit the stimulant and could take from one to two ounces of the milk solution every two hours. As soon as the infant could suck, an ordinary nursing-bottle was employed. The result was entirely satisfactory.

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[1] Auvard: "De la couveuse pour enfants." *Arch. de Tocologie*, Oct., 1883, p. 577. The account given above is copied from abstract furnished to the *Am. Journ. of Obstet.*, April, 1884, by Robert H. Grandin.—(*Taken from Lusk.*)

These cases have been introduced to show how easily, with ordinary care and proper alimentation, premature and feeble infants may be saved, but the method is not comparable to Tarnier's "hatching-cradle." Since the introduction of this machine in the Maternité at Paris the mortality of premature infants has been reduced from 66 per cent. to 36.6 per cent.

The general management of cases of scanty and defective lactation consists in local and mechanical, hygienic, dietetic, and medicinal treatment. A discussion of the details of these several methods would involve an elaborate and unprofitable review of the subject, concerning which a vast amount of nonsense has been written, and for the treatment of which many remedies have been recommended, both by physicians and laymen, with which the writer has had no experience, and of the value of which there is no confirmatory evidence. Nevertheless, the subject is too important to be passed without comment.

Various local and mechanical means have been employed to provoke and increase the flow of milk. Suction, titillation of the nipple in imitation of the process of milking animals, pressure, kneading, gentle friction, electricity, fomentations, and the application of various stimulating substances have been employed with more or less success. Of these, suction and electricity have yielded the most satisfactory results. Suction is the most certain and powerful means of promoting, increasing, and preserving the lacteal function. This is illustrated by the numerous instances of maidens and barren women, and of the few cases of males, who have established a copious secretion of milk, and by the cases reported by Livingstone, Dunglison, Thorwarth, Waddy, and others of old women who had long before ceased to menstruate and bear children, who reproduced the secretion and nursed their grandchildren. The preferable mode of suction is by the child. Regular and methodical nursing of the baby will often, especially in the cases of natural scantiness of flow and torpor of the function, promote the secretion, and in those cases of defective lactation due to insufficient, irregular, or over-nursing it may completely restore the gland to its normal condition.

Electricity has not been so extensively employed, but in the hands of those who have given it a fair trial the results have been encouraging. It is a valuable adjuvant to suction. It stimulates the nerve-supply and circulation and promotes the nutrition of the gland.

The local treatment of the gland by the application of plasters, ointments, oils, embrocations, and poultices for the cure of any form of defective lactation is useless.

The hygienic treatment refers to personal and domiciliary cleanliness, healthy exercise in the open air, proper sleeping apartments, sufficient and refreshing sleep, fresh and pure air, protection from the debilitating influence of continuous high temperature and from the equally injurious effects of severe cold, and sufficient and proper clothing. The change of residence from town to the country or to the seashore sometimes promotes an abundant flow of good milk. In short, the hygienic rules and regulations which are so conducive to the health of nurslings are equally important for the mothers.

The dietetic is the most important of the several methods of treatment, and yields the most satisfactory results. This is so generally recognized that it is almost exclusively employed. There is, however, no universal diet suitable for every mother, no continuous regimen of specified foods which can be relied upon in every case with uniformity and constancy of results. The general law governing the dietetic management is to supply such foods as are simple, nutritious, easily digested and easily assimilable, and to avoid such as may prove injurious to the nursling. It is worse than useless to attempt to sustain life, and at the same time nurse a baby, upon crude articles, knick-knacks, candies, preserves, pickles, bonbons, together with teas, ptisans, and potations. The watery constituents may be increased, but the nutritive quality of the milk will be deteriorated. A judicious combination of animal and vegetable foods is always desirable. Strong salt foods and indigestible and acescent fruits and vegetables should be avoided. The starchy, saccharine, gummy, and ligneous vegetables should be used in moderation. Neither should the diet be exclusively albuminous. Fats in moderation are beneficial. Oatmeal and barley are generally admissible. Fish, tender birds, crabs, and oysters are considered specially efficacious. Routh recommends whiting soup and conger-eel soup as milk-producing foods.

The proper dietary management of puerperal women, especially during the earlier days of the puerperium, will influence favorably the lacteal secretion. The practice in times past, and one too common now, of limiting the diet of recently-confined women during the first week to tea and toast or some other equally innutritious aliment, has given way to a more generous system of feeding women who have to live themselves and feed another. The process of making milk in the laboratory of one's own person must consume a large amount of force which can only be replenished by food.

There is great diversity of opinion in regard to the value of drinks. Perhaps the rule which governs most women is the special fondness for a particular beverage. Good, pure, wholesome drinking-water, in requisite quantities, is certainly unobjectionable and harmless, and perhaps equally as efficient as the more palatable and valued compounds and mixtures of alcohol. Stimulating and appetizing drinks are sometimes very efficient promoters of digestion, but no healthy nursling needs alcohol, and when sick and needing it, it had better be fed from the spoon than nursed from the intoxicated mother.

To even enumerate the medicines, disgusting compounds, and nauseous mixtures which have been suggested, employed, and extolled as galactopoëtics by their inventors and discoverers would be a waste of time and space. No one but themselves has ever witnessed the benefits which their enthusiasm has so lavishly bestowed. The simple rule of guidance in the medical management of cases of insufficient and defective lactation is to address the remedies to the improvement of the health of the mother. Restore her, if possible, to the condition of a vigorous and healthful woman in the prime of life. So far as this may be accomplished, so far will all be done that can be to restore the sufficiency and richness of the milk.

Supplemental Lactation.—For the present the primary object is the prevention of the injurious effects of defective lactation upon the young infant. The chief obstacle to the management of such cases is the difficulty of an early recognition of the precise nature of the cause. This difficulty in most instances grows out of the trivial character of the initial symptoms and ignorance on the part of the mother or unwillingness to believe that the cause is attributable to any physical defect of her organism or any impropriety in her conduct or her method or manner of nursing. Generally, the innocent but ill-fed baby is charged with various disabilities and flagrant exhibitions of connate perversities, and dosed with medicines until some serious organic change has taken place. In all cases of defective lactation the baby must be protected, either by removal of the cause of such defect, or by supplementing the natural aliment, or by weaning and artificial lactation. How best to supply the deficiency is an important question. Common sense would reply, With the milk of another woman; but common experience teaches that this method is not only inexpedient and impracticable, but may entail untold evils upon the defenceless nursling. The mercenary wretch who sells her breasts, and thus robs her own offspring of its birthright, leaving it to suffer or perhaps to starve, and often abandoning or destroying it, is not fit, either morally or physically, to properly nourish the child of another.

The model wet-nurse should be a woman of suitable age who has lost her own child at about the same age as the foster-child. She should have a breast of good and abundant milk; be free from actual or hereditary predisposition to disease; possess a kindly disposition and even temperament; have no vicious, gluttonous, lazy, or uncleanly habits; and, finally, be animated by a love of children rather than the money-value of her services. When such an one can be had she will, in some measure, fill the mother's place.

ARTIFICIAL LACTATION.—As milk is the only natural, it should be the exclusive, diet of young nurslings. The milk of an animal is the only suitable substitute for breast-milk, and the only proper supplemental aliment when the mother's supply is defective or scanty. There may occasionally occur an exception to this general law due to some digestive idiosyncrasy of the infant, but most frequently the exception is only apparent and attributable to some impropriety in the management of the baby or some mistake in the preparation or preservation of the milk. Cow's milk is preferable, because it is most abundant, most easily obtained, and is free from any disagreeable odor. To adapt the milk of the cow to the purposes of artificial lactation the proportions of solids and water must be approximated to the percentages found in human milk. This is done by adding sugar and water according to the age of the nursling and corresponding changes which take place in the breast-milk from month to month. This law cannot, however, be followed in every case, for infants differ very much in digestive and assimilating capacities. Most frequently, too much sugar and too little water are added, especially during the earlier weeks of nursing. It often happens that the quantity of water and sugar must be varied from day to day until the proper proportions are ascertained by the evidences of relief and subsidence of digestive disturbances.

Human milk is alkaline, cow's milk is acid, but least so when the animal is pasture-fed. The acidity continuously increases from the time of milking. Consequently, the addition of an antacid is a necessary part of its proper preparation; and this is the more necessary because of the constant tendency of milk-sugar to lactic-acid transformation.

The casein of cow's milk coagulates in firm and dense masses, that of woman in loose and flocculent shreds; hence the latter is more easily digested. The more stale and acid the milk the quicker and firmer the coagulation. Various suggestions have been made to obviate the rapid and firm coagulation of cow's milk, but none have fulfilled the object. Perhaps, says Jacobi, there is no way of making the casein of cow's milk any more digestible than it is as found in the natural condition.

Cow's milk contains more butter than human milk; hence the greater tendency to the formation of fat acids, which are so frequently the cause of disturbances in bottle-fed nurslings. The formation of fat acids in the stomach and their admixture with the pancreatic fluid neutralize its property of emulsifying and preparing the fats for absorption, producing intestinal indigestion. Intestinal digestion, at best, is feeble in very young nurslings. It is always judicious to add to the milk a fluid prepared from barley or oatmeal, the former when diarrhœa is present, the latter when constipation exists; but when either is added the quantity of food given at each feeding should not be increased.

Butter, which is present in so much larger proportion in cow's than in human milk, seems both from experimental investigation and clinical observation to be the constituent most productive of digestive disturbances. Dilution is the most effective method of correcting or obviating this objection.

As a rule, milk is the only fluid a young baby ever gets, and generally, especially in hot weather, this furnishes an insufficient supply of water for the purposes of the animal economy. Water is as necessary as food; in fact, digestion cannot be carried on nor can health be maintained or life sustained without it. But it is not necessary to convert the alimentary tract of a nursling into a common funnel through which all the liquids and slops at a housekeeper's command are to be poured.

The milk from a herd is preferable to that from one cow. As soon as the milk is received—and there should be at least a morning and evening supply of fresh milk—it should be prepared by the addition of hot water or a decoction of barley or oatmeal in quantity sufficient for the proper dilution, to which the alkali should be added. It should then be placed, in a covered vessel, in a refrigerator, and as needed the required quantity should be warmed and sweetened with white sugar. This process of scalding the milk has appeared to secure all the benefits of heat, and, when the other necessary attentions—perfect cleanliness and purification of every utensil employed and of the place of keeping—are carried out, has usually proven satisfactory as a method of preservation.

Artificial lactation may be performed with the spoon, mug, or nursing-bottle; the last is the preferable method. The bottle should be one with a smooth and even internal surface, without shoulders, angles, or corners or inverted bottom, to which should be adjusted, by means of the stopper, a flexible tube with a soft mouthpiece, and attached at the distal end to a glass tube within the bottle. When the child has been fed, any remaining portion of the prepared milk should be thrown away, the different parts of the nursing apparatus separated, thoroughly cleansed, and laid aside in an alkaline solution. When the infant ceases to suck at the mouth-piece the bottle should be removed. The child should not be urged to take food when it has enough, nor should it be allowed to hold the bottle any longer than is necessary, or to dally and play with it, sucking and quitting or sleeping and waking with the mouth-piece held between its lips. The warmth of the body and hands and the lapse of time favor and hasten the deteriorating changes which are so liable to occur in milk.

Condensed Milk.—Condensed milk has been very extensively employed as a substitute for breast-milk, and there exists a contrariety of opinion in regard to its value. The writer's experience differs somewhat from either extreme view, and this difference relates to the peculiarities of infants. When prepared with proper proportion of barley-water or oatmeal gruel or largely diluted, it has, in many instances, proven acceptable and sufficient. It is, nevertheless, true that some infants fed exclusively upon it manifest a feeble resistance to morbific agencies, but this is very far from being the general rule.

Other Substitutes.—As a matter of fact, there is no such substance or aliment as a substitute for milk. It is true that many children have been reared without ever having tasted breast-milk. It is equally true that the exclusion of breast-milk from birth yields the worst results. It is alleged that there are occasional instances when infants cannot be nourished with milk. Such cases are so rare that the writer cannot recall a single instance occurring in his own practice. The "sugar-teat," corn-starch, and "cracker victuals" ought to be universally condemned. The various manufactured and patented "infant foods" are mere articles of traffic, as unsuitable as they are unreliable. Occasionally an infant in vigorous health is exhibited as an illustration of the remarkable nutritive quality of some one of these compounds, but it is more probably the exhibition of a development attained in spite of them.

The first and most important lesson in the art of feeding the newly born is to teach the parents that they can learn all that is absolutely necessary to know; and the second is to disabuse their minds of the errors which ignorance, superstition, and bad example have inculcated. Every mother knows that milk is the natural aliment of babies, and that hand-feeding is always attended with more or less danger. She knows equally well that the milk of an animal is the only substitute for breast-milk, but she is generally ignorant of the methods of preserving and preparing it.

ON THE MECHANISM OF LABOR, AND THE TREATMENT OF LABOR BASED ON THE MECHANISM.

By R. A. F. PENROSE, M. D., LL.D.,

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THE MECHANISM OF LABOR.

By the expression "the Mechanism of Labor" I mean the mode by which the fœtus passes through the cavity of the pelvis and is expelled from the body of the mother.

The fundamental principles of the science of Obstetrics are based on the relationships which are possible between the pelvis and the fœtus passing through it during labor. It is essential, therefore, to take a *preliminary glance* at these relationships before beginning our investigations: for a more thorough discussion of the anatomy of the pelvis and fœtus the reader is referred to the ordinary works on anatomy and obstetrics.

The Pelvis.

The pelvis is an irregular bony cavity terminating the trunk inferiorly. It is composed of four bones—two symmetrical bones in the median line behind—viz. the sacrum and coccyx; while its anterior and lateral walls are formed by the ossa innominata.

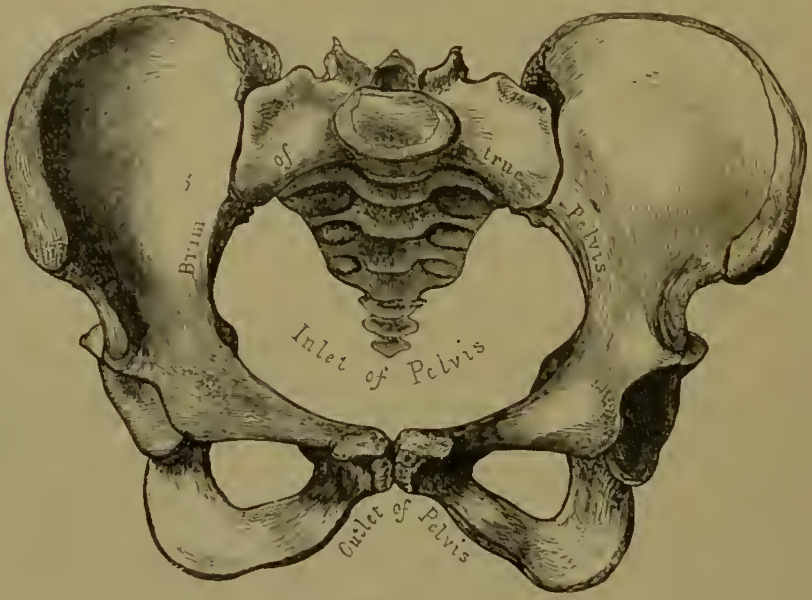
Studied in its general aspect, it may be described as representing a truncated cone slightly flattened in an antero-posterior direction, its base above and inclined slightly forward, the truncated portion below and a little back. We shall pass by the peculiarities of its external surface, and look only at the internal.

The Internal Surface of the Pelvis.

The most superficial inspection of the internal surface of the pelvis shows that Nature has divided it into two distinct portions, the dividing-line being the linea ilio-pectinea. All above this line constitutes the superior or abdominal pelvis; all below, the inferior, the lesser, or the true pelvis.

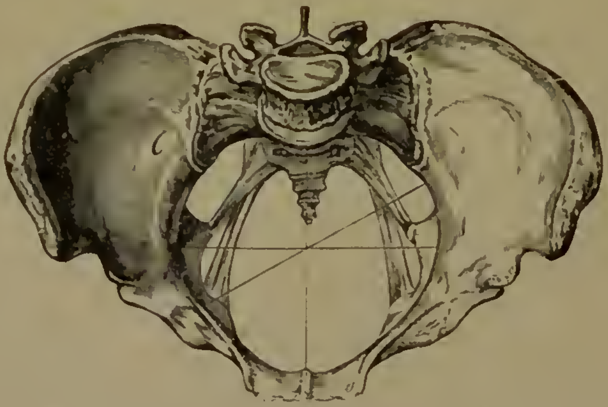
The Superior Pelvis.—The superior pelvis is of very irregular figure; it is a species of pavilion or entrance to the true pelvis. It may be described as having a great notch in front, which in the recent subject is filled by the abdominal muscles; a notch behind, filled by the lower lumbar vertebræ; the sides are expanded and elevated by the alæ of ilia. The superior pelvis is of comparatively little importance in an obstetrical point of view, since, unless extremely deformed, it cannot interfere with the passage of the child. Three diameters may be remembered. All the pelvic and fœtal diameters given in this article are those taught by Dr. Hodge, and may be found in his *System of*

FIG. 222.



Female Pelvis (adult).

FIG. 223.



Brim of Pelvis, showing antero-posterior, oblique, and conjugate diameters (Gallabin).

Obstetrics, and may be considered as the obstetrical teachings of the University of Pennsylvania from the foundation of the chair of Obstetrics: From the anterior superior spinous process of one side to the same point on the opposite side, *about* nine inches; from the middle of the crest of the ilium of one side to the opposite side, *about* eleven inches. The depth of the superior pelvis from the top of the crest of the ilium to the linea ilia is three and a half inches.

Diameters of the superior pelvis to be recollected: 11 inches, 9 inches, 3½ inches.

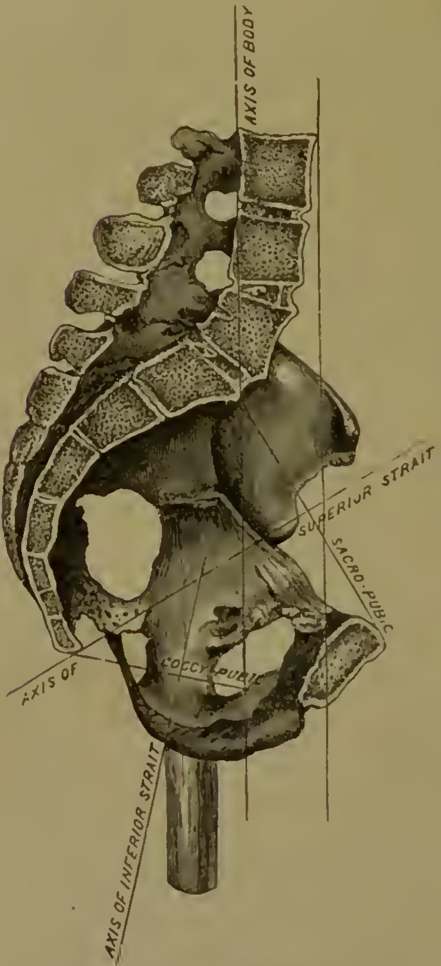
The Inferior or True Pelvis.—The inferior or lesser pelvis is the real obstetrical pelvis. If all the parts forming the abdominal pelvis be removed by a saw, a species of bony ring will remain, much narrower in front than behind or at the sides, forming a curved canal larger in the middle than at either extremity, and slightly bent forward. This canal has two openings—the one above, called the *superior strait;* the lower, the *inferior strait.* These are called "straits" because they are more contracted than the space between them, which is called the *concavity* or *basin* of the pelvis. Four regions may be noticed in this cavity.

The *anterior* region is greatly notched by the pubic arch: its bony surface is convex from above downward and concave transversely; the posterior part of the pubic articulation projects vertically in the middle to the extent of two- or three-eighths of an inch; toward the sides we find a smooth surface, and then the internal obturator or subpubic fossa.

The *posterior* region is formed by the faces of the sacrum and coccyx: it is concave from above downward, and exhibits the peculiarities which characterize these bones.

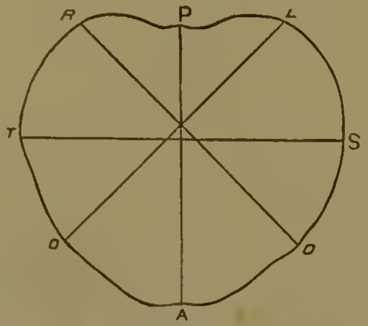
The *lateral* regions present two quite distinct portions. The anterior portion is wholly osseous: it corresponds to the back part of the acetabular cavity and to the body and tuberosity of the ischium; its direction is from above downward, from without inward, from behind forward. The posterior portion is chiefly ligamentous and foraminous, being formed by the internal face of the sacro-sciatic ligaments and foramina. This portion has an opposite direction from the anterior portion, the inclination being from above downward, from without inward, and from *before* backward. If we now make a vertical section, in the median line, through the sacrum and pubis, we divide the pelvis into two lateral halves, and can notice the peculiarities to which we have already referred. A glance will show that the points of the spines of the ischia are the summits of two inclined surfaces on either side—one surface inclining inward, downward, forward; the other surface inclining inward, downward, and backward. We may now make another section of each lateral half by a cut passing from the points of the spines of the ischia vertically to the linea ilia, and we shall then have the pelvis divided into four pieces; and these represent what are commonly called the *inclined planes* of the pelvis. The anterior inclined planes, which are the longer and larger, begin at the points of the spines of the ischia, about one inch in front of the sacro-iliac symphyses, and about the middle of the sacro-sciatic ligament, and, passing obliquely downward and forward, terminate at the anterior edges of the ischio-pubic rami. The posterior inclined planes begin at the points of the spines of the ischia, pass downward and backward, and terminate at the middle of the sacrum and coccyx. The general shape of the pelvic cavity is rather that of a four-sided lozenge than oval, as is commonly supposed. According to many authorities, these inclined planes play an important rôle in the mechanism of labor. They are supposed to influence the movements of the presenting part, causing it, when it strikes anterior to the point of the spine of the ischium, to pass to the arch of the pubis, and to the hollow of the sacrum should it strike posterior to the spine.

Fig. 224.



Transverse Section of Pelvis, showing the diameters.

Fig. 225.



The Inlet or Superior Strait: *PA*, antero-posterior diameter; *TS*, transverse; *RO*, right oblique; *LO*, left oblique.

The Superior Strait.—As already mentioned, the upper opening of the pelvis is called the *superior strait*. The shape of this opening is oval, resembling the heart on playing-cards; a better description, however, is that the shape of the superior strait in the *bony pelvis* is that of a curvilinear triangle, having its base behind and its apex in front. Constituting as it does the entrance to the true pelvis, and therefore the first part of that narrow canal through which the fœtus has to pass, great pains have been taken to study it.

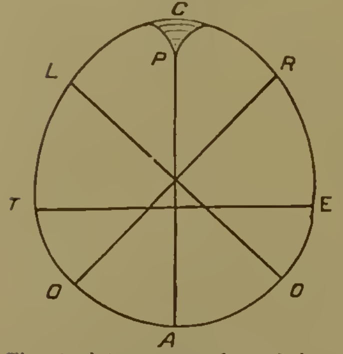
Plane and Axis of Superior Strait.—A plane is a surface without thickness. By the plane of the superior strait we mean merely the surface of the upper opening into the pelvic cavity. In a well-formed woman, *when she is erect*, the promontory of the sacrum is three inches and nine or ten lines above the upper margin of the symphysis pubis. It is evident, therefore, that when the female is *erect* the plane of the superior strait is oblique and inclined from above downward and from behind forward. The degree of this inclination is 55° or 60° to the horizon. The degrees of inclination of the plane being fixed, it is easy to determine its axis. The axis of any plane is a line drawn perpendicularly to its centre. The axis of a horizontal plane, therefore, is a vertical line, and the axis of an oblique plane is an oblique line. The plane of the superior strait of the pelvis, *when the individual is erect*, being, as we have just seen, an oblique plane, its axis must necessarily be an oblique line; and we find it to be a line passing from the coccyx through the centre of the plane of the superior strait, and perpendicularly to it, and, if continued, passing out of the body through the linea alba just below the umbilicus. It must be recollected that the obliquity of the plane of the superior strait, and consequently the direction of its axis, depend on the position of the individual. The inclination of this plane is 55° to 60°, as we have just seen, when the woman is *erect:* it is much less oblique when she is sitting, still less when she is bent forward. A knowledge of the axes of the pelvic straits and the pelvic cavity is essential to the intelligent performance of almost all operations during labor.

Diameters of the Superior Strait.—As already stated, the measurements given are those recognized as standard in the University of Pennsylvania, and are to be found in Hodge's *System of Obstetrics.*

The circumference of the superior strait measures about thirteen inches and a half. We study three diameters of the superior strait. The *bis-iliac diameter*, commonly called the *transverse*, at the widest transverse distance from one linea ilia to the other, measures, in the bony pelvis, five and a quarter inches. The *oblique diameter*, measured from the acetabulum or the pectineal eminence of one side to the opposite sacro-iliac symphysis, is five inches. The *antero-posterior* or sacro-pubic diameter is measured from the promontory of the sacrum to the upper edge of the symphysis pubis, and is four inches.

The Inferior Strait.—The inferior strait of the pelvis is more contracted than the superior, and more irregular in its outline; it possesses three tuberosities or osseous projections, separated by as many deep notches. Its general shape resembles the heart on a playing-card, although the indentation made by the coccyx disappears at the moment of the head's passage in labor, and therefore the shape of the opening may be considered as oval. The tuberosities of the ischia are placed on a plane somewhat lower than the point of the coccyx, and consequently in the sitting posture the weight of the body rests solely on these tuberosities: this circumstance explains why transverse contractions of the pelvis are far more frequent at the inferior strait than the antero-posterior ones. Of the three notches, the two lateral ones, though very deep in the bony pelvis, are made, in the recent subject, very superficial by the sacro-sciatic ligaments.

Fig. 226.

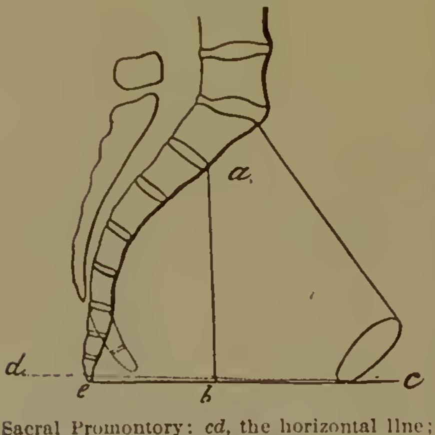


The Outlet, as seen from below: *C*, under surface of the coccyx; *PA*, antero-posterior or coccy-pubic diameter; *TE*, transverse; *RO* and *LO*, right and left oblique diameters.

The anterior notch is called the arch of the pubis. The columns of this arch are distorted outward, as if some round and hard body had been forcibly expelled from the pelvis while the bones were soft; and this arrangement, more marked in the female, favors the escape of the head in labor.

Plane and Axis of the Inferior Strait.—In consequence of the tuberosities being lower than any other parts of the inferior strait, it is evident that, mathematically, it has no plane; practically, however, we may consider the coccy-pubal line as representing the plane. What is the direction of this line? Undoubtedly, when the female is *erect* and not in labor the point of the coccyx is above the lower edge of the subpubic ligament—about half an inch—and hence under such conditions the direction of the plane is oblique from behind forward and from above downward; but during labor, the only time when the direction of the plane is of any moment, the advancing head pushes the coccyx down and back until its point is on a level with, or even below, the lower edge of the symphysis pubis; hence during labor we may declare that the plane of the infe-

Fig. 227.



Sacral Promontory: *cd*, the horizontal line; *ce*, the plane of the inferior strait (during labor); *ab*, the axis of the inferior strait.

rior strait is slightly oblique from behind forward and from below upward. The axis of this plane, under these circumstances, is a line drawn from the union of the first and second bone of the sacrum through, and perpendicular to, the centre of the plane.

Diameters of the Inferior Strait.—The circumference of the inferior strait is about twelve inches. The longest diameter is measured from the subpubic ligament to the point of the coccyx, and is therefore called the coccy-pubal; usually, however, it is called the antero-posterior diameter; it is four inches. The mobility of the coccyx during labor increases this diameter to four and a half inches. The transverse diameter is measured from the inner edge of the tuberosity of one side to that of the opposite, and is hence sometimes called the bis-ischiatic; it is four inches. The oblique diameters are measured from the middle of the ischio-pubal rami to the middle of the opposite sacro-sciatic ligaments, and are four inches. The elasticity of these ligaments increases these diameters a quarter of an inch or more during labor. All the diameters of the inferior strait in the quiet condition of the parts may be considered as four inches, the distensions of labor giving the increase which we have just noticed.

The Diameters and Axis of the Cavity of the Pelvis.—The space between the superior and inferior straits is the cavity of the pelvis. It is in this cavity that the presenting part of the fœtus during labor undergoes its characteristic movements and changes, and hence it is important to understand its planes, its axes, its diameters.

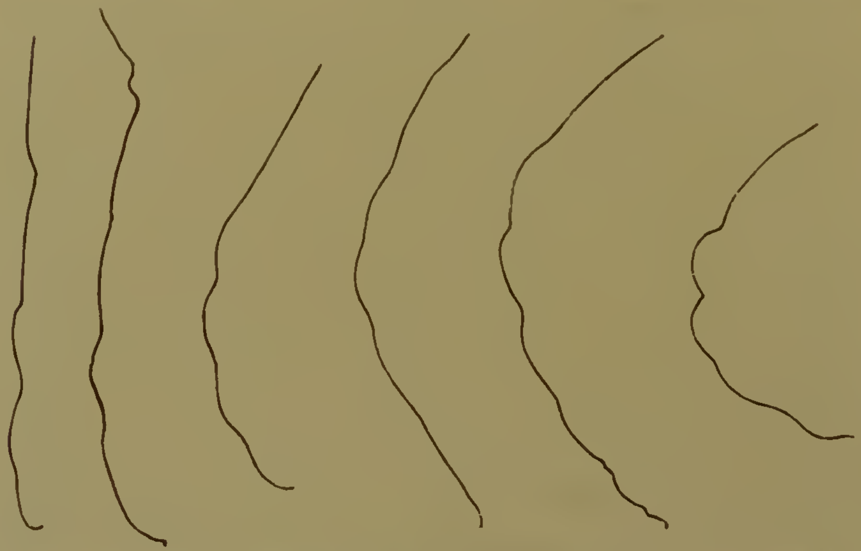
The axis of any canal is a line drawn through the centre of the canal. The axis of a cylinder, therefore, must be a straight line; the axis of a circular canal must be a circular line; and the axis of a curved canal, a curved line. The most superficial inspection of the pelvic cavity shows that the canal is a curved canal; it is evident, therefore, that the axis of the pelvic canal must be a curved line. Closer inspection shows that the curve is entirely due to the curve of the sacrum and coccyx, and that if these bones were straight instead of curved the pelvic canal would be, practically, cylindrical.

We may state, therefore, in a general way—the proposition is so simple that any can comprehend it—that the axis of the cavity of the pelvis is a curved line passing through the centre of the pelvic canal, and parallel to the face of the sacrum and coccyx; in other words, the axis of the pelvic canal is a curved line *identical* in its curvature with the curve of the hollow of the sacrum and coccyx. When we examine a number of sacral bones we shall find that no two are alike in their curvatures: some are nearly straight, some curved almost to deformity: between these two extremes there will be found every shade of different curve. *Hence it follows that the axis of the pelvic canal is not a fixed mathematical curve, but is really a line differing in each female, and de-*

pending absolutely on the curvature of each individual's sacrum and coccyx.

The Diameters of the Cavity.—The *anterior depth of the cavity*, from the top of the symphysis pubis to the edge of the subpubic ligament, is one inch and a half. The *posterior depth*, from the promontory of the sacrum to the point of the coccyx, is four and a half to five inches. The *lateral depth*, from the tuberosity of the ischium to the linea ilia, is three and a half inches. The antero-posterior diameter of the superior strait, as we have already seen, is four inches. From the lower edge of the subpubic ligament to the promontory of the sacrum is four and a half inches. This diameter can be usually readily measured in the living female, so that by deducting a half inch we can approximate to the true length of the antero-posterior diameter of the superior strait —a matter of no little importance in estimating the extent of deformities of the pelvis. From the subpubic ligament to the *hollow* of the sacrum is four and three-quarter inches. The *oblique* diameter of the pelvis is measured from the tuberosity of the ischium of one side to the sacro-iliac symphysis of the opposite side at the superior strait; it is six inches. The *height* of the *arch of the pubis* is two inches. The limbs of the arch, formed by the ischio-pubic rami, are two and a half inches long.

FIG. 228.

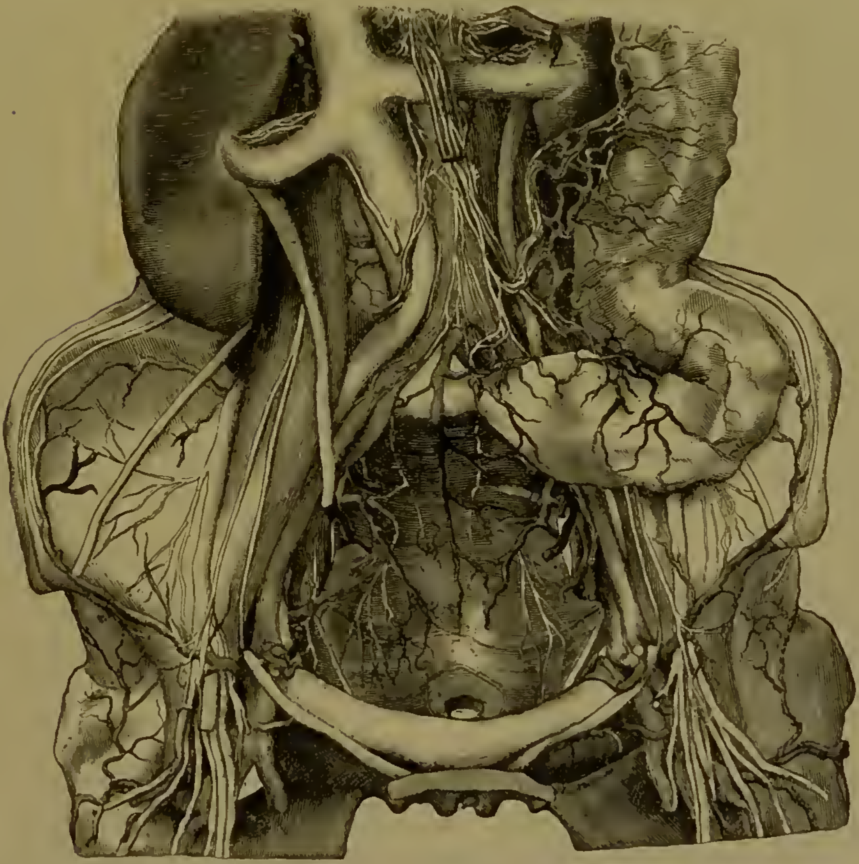


Impressions of Pelves, from specimens in the Medical Museum of the University of Pennsylvania, showing the difference in the sacral curves.

THE PELVIS COVERED BY THE SOFT PARTS.

It is not sufficient to study the bony pelvis alone, however, if we wish to form correct ideas of the pelvis during labor. The changes produced in the form and dimensions of the pelvis of the living female by the soft parts require our special attention.

FIG. 229.



The Pelvis, with Soft Parts (bladder, rectum, uterus, and its appendages having been removed). (From a model in the University of Pennsylvania.)

The superior pelvis, continuous above with the abdominal cavity, encloses and supports the mass of intestines and affords attachments by its walls to two orders of muscles, the one destined to form the enclosure of the cavity, the other filling the iliac fossa. These latter are, on either side, the iliacus internus and the psoas magnus muscles. They change both the shape and size of the superior strait, the one occupying the iliac fossa, the other descending from the sides of the lumbar vertebræ. These two muscles, surrounded and confined by their aponeuroses, form a sort of cushion on either side, and thus furnish an admirable support to the pregnant uterus, and by the elasticity of their structures protect it from the violence of shocks and jars to which it is constantly exposed.

Notwithstanding these muscles, the superior strait of the pelvis still resembles a curvilinear triangle in shape: the base, however, of the triangle is now in front instead of behind, as we studied it in the bony pelvis. The transverse diameter is diminished perhaps half an inch by these muscles; practically, however, the diminution is of no moment, since the muscles are relaxed, and thrown, as it were, to the side when the thighs are flexed, as they are during labor. The antero-posterior diameters are to a trifling degree affected by the thickness of the walls of the bladder and the uterus, as well as the tissues covering the posterior face of the symphysis and the anterior surface of the sacrum, while the location of the rectum slightly shortens the corresponding diameter.

In the cavity of the pelvis are two muscles on either side—the obturator internus and the pyramidal. Finally, the cavity is further diminished by the rectum and bladder and cellular tissue; more especially when the latter is loaded with fat. Consequently, the fœtus descends with greater difficulty in corpulent females.

The perineal strait, though open in the skeleton, is closed in the recent subject, sustaining the viscera of the pelvic and abdominal cavities. It is pierced in the median line by the urethra, the vagina, and the rectum. This fleshy floor is composed of two muscular layers. The upper layer is formed of the levator ani and coccygeal muscles on either side. The lower layer is constituted by the sphincter ani, the transversus perinei, the ischio-cavernosus, and the constrictor vaginæ muscles. The internal pudic vessels and nerves, a large amount of cellular tissue, the pelvic aponeurosis, an intermuscular aponeurosis, and the external integument complete this floor. The levator ani muscles form the foundation of this structure. Arising as they do from the inner surface of the pubis, they continue their origin from the pelvic fascia down to the spines of the ischia; spreading out in a fan-like manner, they descend, enveloping the extremity of the rectum, and are inserted into the structures of the perineum. These muscles meet almost anteriorly, allowing only an opening for the vagina. It is evident that, arising as they do from the whole anterior inclined planes of the pelvic cavity, they must continue these planes clear down to the median line of the body, and also anteriorly to the orifice of the vagina, so that thus the presenting part of the fœtus during labor plays on oblique and inclined surfaces after it has passed out of the bony pelvis.

There are certain peculiarities in the arrangement of the muscles composing the floor of the pelvis which should be noticed. They are inserted by one extremity into tendinous structures and fascia, while the fibres of most of these muscles are indistinct when compared with other muscles, and are mixed up with a considerable quantity of elastic dartoid tissue. Both of these circumstances have much to do with the possibility, without laceration, of extraordinary distension during labor; indeed, the absence of these conditions would simply render dilatation impossible.

THE PERINEUM.

All the soft parts at the outlet of the pelvis form the *obstetrical perineum.* The extent of the perineum in its ordinary conditions is three inches; from the point of the coccyx to the anus there are one inch

FIG. 230.

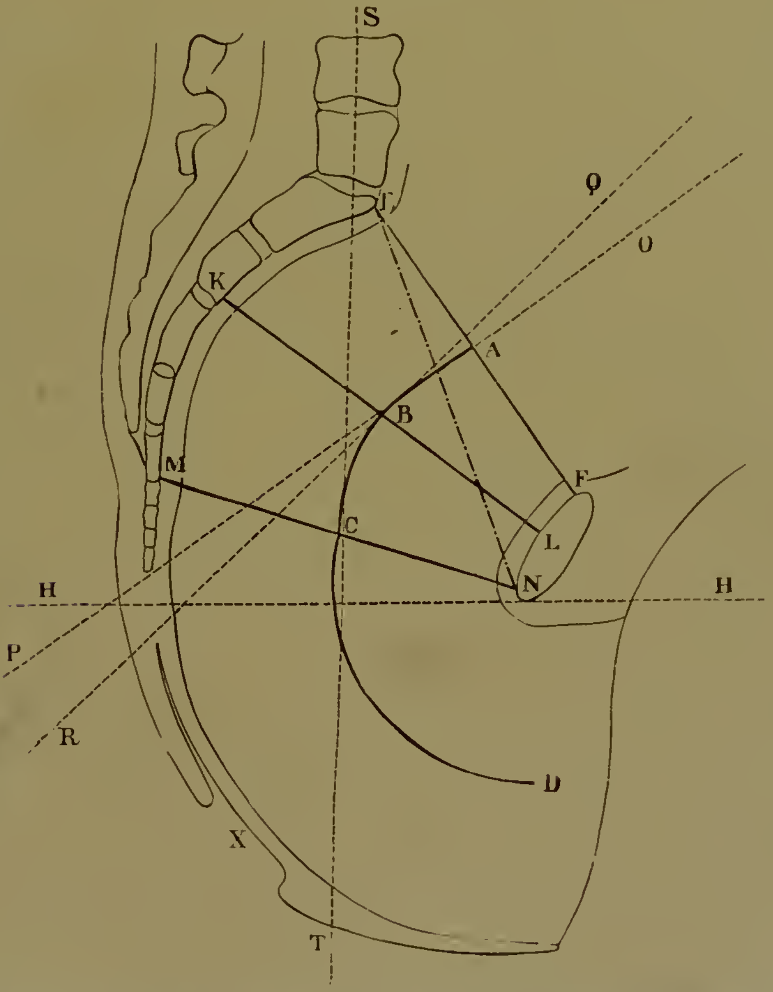


Diagram showing Axis and Planes of Pelvis: *A, B, C,* axis of developed canal of soft parts; *X,* anus as distended in parturition; *E, F,* plane of brim; *K, L,* mid-plane of cavity; *M, N,* plane of outlet; *O, P,* axis of brim; *Q, R,* axis of mid-plane; *S, T,* axis of outlet; *H, H,* horizon; *E, N,* diagonal conjugate or sacro-pubic diameter.

and three-quarters, and from the anus to the vulva there are one inch and one-quarter. As the head is about passing during labor the genital opening, the perineum becomes enormously distended, measuring four to five inches from the coccyx to its anterior margin.

It is evident that the terminal point of the pelvis, covered with soft parts, is not at the coccyx, but at the anterior margin or commissure of the perineum. It is also evident that during the latter moments of labor the perineum is greatly distended—so much so that its anterior border is pushed beyond the subpubic ligament, thus increasing to a very considerable extent the distance from the coccyx, and consequently the distance which the head has to traverse before escaping from the body of the mother.

Finally, it is evident that the head during labor disengages, not in a direction coinciding with the axis of the inferior strait of the bony pelvis, but in the direction of the axis of a plane which may be drawn from the lower edge of the symphysis pubis to the anterior commissure of the distended perineum; in other words, in the direction of a plane drawn from before backward and from above downward.

THE PARTURIENT LINE.

If we want to understand clearly the direction followed by the child in its engagement in, and expulsion from, the cavity of the pelvis, we must add to the axis of the bony pelvis the axis of the uterus above and the axis of the distended soft parts below. This parturient line is, of course, fixed and unchangeable for the bony canal, and variable for the uterus above and the distended soft parts below. Above we meet with different varieties of uterine obliquity, which may affect greatly the engagement of the presenting part. Below, the labor is equally or more influenced by the mobility of the coccyx and the dilatability of the perineal structures.

The axis, then, of the canal formed at the latter moments of labor by the distended perineal structures is a curved line continuous with the curved line of the axis of the bony pelvis. The curvature of this line is due to the extent of the perineal bulging and stretching, and consequently varies in every case.

It must be borne in mind that in all the above descriptions of the axes of the planes and cavity of the pelvis the individual has been supposed to be erect. Should she lie upon her back, the plane of the superior strait, instead of looking upward and forward, would be turned upward and backward; the plane of the inferior strait would look directly forward; while the plane of the terminal outlet formed by the distended perineum would look forward and upward.

The Fœtus.

The fœtus at term is from eighteen to twenty inches in length. The bones are only partly ossified, and hence admit of great compression and exhibit great flexibility. The diameters of the fœtal body, though as large as, or even larger than, those of the head, are much more compressible. Thus, from one shoulder to the other, the *bis-acromial* diameter is about four inches, but is readily reduced by pressure to three and a half, or even to three, inches. The dorso-sternal diameter, from the spinous processes of the dorsal vertebræ to the sternum, is three inches, easily reduced to two and a half inches. The transverse diameter of the hips, or bis-iliac diameter, is about three inches. The antero-posterior diameter of the child's pelvis is about two and a half inches; when the thighs are flexed on the abdomen, however, the antero-posterior diameter, including the thickness of the flexed extremities, may be considered as three inches.

The head is the most important part to be studied. Its shape is ovoid; it has two extremities—the occipital and the mental, the occipital being the larger part. The bones of the head entering into the composition of the face and base of the head are almost perfectly ossified at term; they are, in consequence, incompressible, and thus during labor the important nerves of special sense and ganglia at the base of the brain are protected from pressure. The bones of the cranial vault, however, are very imperfectly ossified at term. They are connected by what are called sutures or commissures, allowing of considerable mobility, or even of overlapping, of the adjoining bones, and thus increasing greatly the compressibility of this portion of the head. I shall assume that the reader is familiar with the bones, sutures, and fontanels of the fœtal head, and shall not occupy space by describing them.

We must study on the fœtal head several circumferences which must be well understood, since in different presentations different circumferences offer their diameters to the diameters of the pelvis. When the child's head is perfectly flexed we have it presenting its most favorable circumference. This circumference is represented by a line which, starting at a point midway between the occipital protuberance and the occipital foramen—in other words, the nape of the neck—passes over the parietal protuberances and terminates at the posterior point of the anterior fontanel. We term it the *cervico-bregmatic* circumference; sometimes it is called the occipito-bregmatic or the suboccipito-bregmatic circumference. We consider in this circumference two diameters. The biparietal diameter, the largest transverse diameter of the head, measured from one parietal protuberance to the other, is three inches and a half. The cervico- or occipito-bregmatic diameter is measured from the point midway between the occipital foramen and the occipital protuberance to the posterior margin of the anterior fontanel; it is three inches and a half. In other words, the cervico-bregmatic circumference of the child's head is a circle, and its two diameters are each three and a half inches. The circumference itself measures about ten and a half inches. This circumference bounds the oval of the posterior extremity of the head, the summit of which is the *vertex.*

There are various definitions given to the term "vertex." By some the anterior fontanel is so called; some apply it to the posterior fontanel; while, again, the term is also used to designate the space between the anterior and posterior fontanels. The word "vertex" means the "top of a hill," the "point of a cone;" hence the vertex of the head should be the top of the head. Now, the head in natural labor is flexed, and consequently the posterior fontanel is at this time its highest point. Hence it seems that the proper definition of the term "*vertex*" in obstetrics should be *that part of the head immediately around the posterior fontanel.* When the word "*vertex*" is used in the following descriptions, it will be employed to indicate the posterior fontanel and a small circle of about one inch in diameter of which the fontanel is the centre.

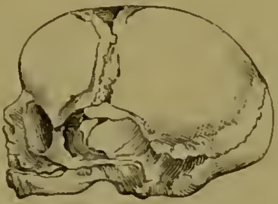
When the head offers at the superior strait only partially flexed and at right angles with the spine, a new circumference must be studied. We call it the *horizontal* or the *occipito-frontal* circumference. This circumference is measured from the occipital protuberance over the parietal protuberances to the os frontis. We study two diameters—the occipito-frontal diameter, measured from the occipital protuberance to the os frontis, which is four inches; and the biparietal diameter, which is three and a half inches. The horizontal circumference measures twelve inches. The *anterior* fontanel is the lowest part in this presentation.

When the head becomes still more extended, so as to bring the top of the forehead as the most dependent part, we have a circumference offering which we call the *sagitto-mental* or *parieto-mental* circumference. This circumference is measured from the middle of the *sagittal* or *biparietal* suture to the point of the chin. It measures twelve and a half inches. It has two diameters—the *sagitto-mental* or *parieto-mental* diameter: measured from the middle of the sagittal suture to the chin, it is four inches and a half; and the biparietal diameter, which is three inches and a half. In this presentation the cervico-frontal diameter is in the axis of the superior strait; it is measured from the nape of the neck to the top of the forehead, and is four inches: by pressure it can be reduced to three and a half inches.

When the head offers at the superior strait in a condition of complete extension, the circumference involved is called the *facial* circumference. The facial circumference is measured from the top of the forehead to the chin; the root of the nose is the centre of this circumference. There are two diameters: one, the fronto-mental, is measured from the top of the forehead to the chin, and is three inches; the other, the transverse diameter, is called the bimalar, and is two and a half inches, though if the child's face is large and fat the bimalar diameter may be three inches.

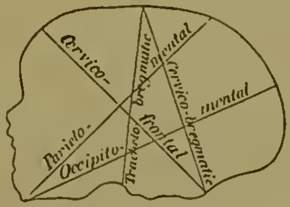
The facial circumference, however, is not the only circumference to be studied in face presentations, since as the face descends the circumference measured at the middle of the head must be involved. This circumference we call the trachelo-bregmatic, and it is measured from the anterior edge of the foramen magnum to the posterior part of the anterior fontanel. There are two diameters: one, the *trachelo-bregmatic* diameter, is measured from the anterior edge of the foramen magnum to the posterior part of the anterior fontanel; it is three and a half inches; the other, the biparietal diameter, is three and a half inches. The trachelo-bregmatic circumference measures ten and a half inches, and both in its diameters and circumference is identical with the cervico-bregmatic circumference, which we have already studied.

FIG. 231.



Side of the Head.

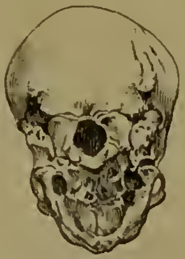
FIG. 232.



Lateral Diameters of the Head.

In presentations of the pelvic extremity of the child the head often offers at the superior strait more or less extended, and we are obliged to consider the circumference of the base of the head—the *occipito-mental* circumference, measured from the occipital protuberance to the chin. The diameters of this circumference are the *occipito-mental:* from the occipital protuberance to the chin, the longest diameter of the

FIG. 233.



Inferior Region, or Base of the Head.

FIG. 234.

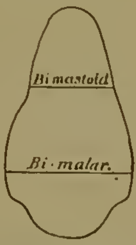
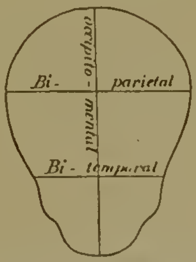


Diagram of the Base of the Head.

FIG. 235.



Actual Obstetric Extent of the Base of the Head.

head, it is five inches; and the biparietal, three and one-half inches. The occipito-mental circumference measures thirteen and a half inches.

In presentations of the base of the head we also have involved the bimalar diameter, two and a half inches, and the bimastoid diameter, two inches. In any difficult labor strong compression may reduce the transverse diameter, the biparietal, to three inches, and may so elongate the head as to increase the occipito-mental diameter to six or seven inches.

Before concluding our inspection of the fœtus we should notice the articulations of the head with the spinal column. The foramen magnum is not at the centre of the base of the head, but behind the centre; hence that portion of the head anterior to the foramen magnum represents the long arm of the lever, and consequently, when the head offers in labor and equal forces of resistance are impressed on its anterior and posterior parts, flexion of the head, so essential to an easy labor, is secured as a necessary and constant result.

The nature of the articulation of the head with the vertebræ, and the movements possible, are to be remembered. The occiput is connected with the atlas by a close union admitting only of flexion and extension—movements in the fœtus far more extensive than in the adult. The articulation of the axis with the atlas, being ginglymoid, only permits rotation, and this is limited to a quarter of a circle in either direction. Hence it must always be borne in mind in obstetrical manipulations that a forced rotation of the head, to a greater extent than a quarter of a circle, exposes the child to the danger of dislocation of its cervical vertebræ.

In conclusion, it is not uninteresting to consider the influence that sex, race, civilization, and education have in increasing the size of the fœtal head, and, consequently, the difficulties and dangers of labor.

The head of the male fœtus is larger, as a rule, than the head of the female, the excess being about a half inch in the cervico-bregmatic circumference; but this half inch excess is quite sufficient to make a serious difference in the chances and dangers of labor both to mother and child. Sir James Simpson[1] gives a number of very interesting tables on this subject. He shows that a much greater number of mothers die from parturition and its immediate consequences in giving birth to male than female children, and that a much larger number of males die during labor than females, the proportion of stillborn boys to stillborn girls being as 151 to 100. Of children born alive, more males than females suffer from the morbid states and injuries resulting from parturition.

Race, civilization, and education also have a marked effect on the fœtal head, modifying not only its size, but also its shape, and should always be taken into consideration in forming a prognosis in any particular case where these elements are involved.[1]

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[1] See *Edinburgh Medical and Surgical Journal*, Oct., 1844.

Direction of the Forces.

In studying the mechanism of labor we must bear in mind the direction in which the expelling forces act in natural labor. These forces, which consist of the contractions of the uterus, aided, during the second or expulsive stage of labor, by the contractions of the diaphragm and abdominal muscles, act in *natural* labor in the direction of the axis of the superior strait. In labor there seems to be a natural disposition on the part of the woman to bend forward—a movement that brings the axis of the body to coincide more or less with the axis of the superior strait, and thus tends to secure the maximum results from the parturient efforts.

Presentation and Position.

In contemplating the fœtus and its possible relationships to the pelvis it is evident that it can pass easily through the cavity *only* when it offers by one or the other extremity or pole of its long axis. It is equally evident, however, that any other part may offer at the superior strait, and, as the mechanism of labor must depend on the part offering, we must, before entering on the subject of the mechanism, define presentation and position.

Presentation.—By *"presentation" we mean that part of the fœtal ellipse that offers toward the centre of the superior strait.* We must not confound (as is constantly done) the term *"presentation"* with the word *"position."*

Position.—By *"position" we mean the varying relationships which the same presenting part may bear to different parts of the superior strait.* Thus the child is offering by its head; it is a *presentation* of the head. The occiput is turned to the symphysis pubis; it is an occipito-anterior (occipito-pubic) *position*. The occiput is turned to the sacrum; it is an occipito-posterior (occipito-sacral) *position*. Position, the varying relationships which the same presenting part may bear to the different parts of the superior strait.

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[1] In a recent paper ("Midwifery among the Aborigines," *Prov. Med. Journ.*, Jan., 1886) Dr. Parker says: "Rupture of the perineum seems to be a rare occurrence among the full-blooded Indians, but among the more civilized half-breed women I was told that it was becoming quite common." This can be ascribed, of course, to nothing else than the increasing size of the fœtal head.

Surgeon Parahh of India (*London Lancet*, April 10, 1886) measured large numbers of fœtal skulls of European, Persian, Parsee, Siamese, and Hindoo races, and found the measurements to increase in direct ratio to the height of civilization to which the different races had attained.

We study labor under two divisions—natural labor (or eutocia) and preternatural labor (or dystocia).

In natural labor the process is accomplished with safety to the mother and the child, without any great danger or difficulty, and without assistance. Natural labor implies that the mother is in a good anatomical and physiological condition; also, that the child does not exceed the normal as to its size or the size of its parts; and, finally, that the *presentation* and position are favorable. Now, we have just seen that there are but *two* presentations possible in natural labor—viz. presentation of the head and presentation of the pelvic extremity of the child. Experience shows that head presentations are by far the more common; hence we will begin with head presentations.

PRESENTATIONS OF THE VERTEX.

All statistics show that presentations of the head vastly exceed in frequency all other presentations, the proportion being about 95 or 96 head presentations in every 100 cases of labor. Under the term "head presentations" are included all presentations of the cephalic pole of the fœtus, whether they are presentations of the vertex, of the face, or of any other part of the head. We shall presently see, however, when we investigate the causes of presentation and position, that the common and natural form of head presentation is presentation of the vertex—*i. e.* presentation of the *flexed* head—and that all other forms of head presentation are the results of causes easily understood, and which do not belong to typical natural labor. We say, then, that *vertex* presentations are the common and natural forms of head presentations. A striking fact in vertex presentations is that the great majority have the same position; that is, the great majority have the occiput turned in front and to the left side—left occipito-anterior position. The next most common position in vertex presentations is with the occiput turned behind and to the right side. Naegele says that in every 100 cases of vertex presentation 70 have the occiput turned in front and to the left side, and 30 have the occiput turned behind and to the right side, and that all other positions are very rare and altogether exceptional.[1]

THE FŒTAL ELLIPSE.

At the full period of gestation we find the fœtus folded in the cavity of the uterus in a very peculiar and characteristic attitude. The head is flexed; the feet are bent up in front of the legs; the legs are strongly flexed on the thighs; and the thighs are applied to the anterior surface of the abdomen. The knees are separated from each other, but the heels lie close together on the back part of the thighs; the arms are placed on the sides of the thorax; the forearms are flexed and thrown

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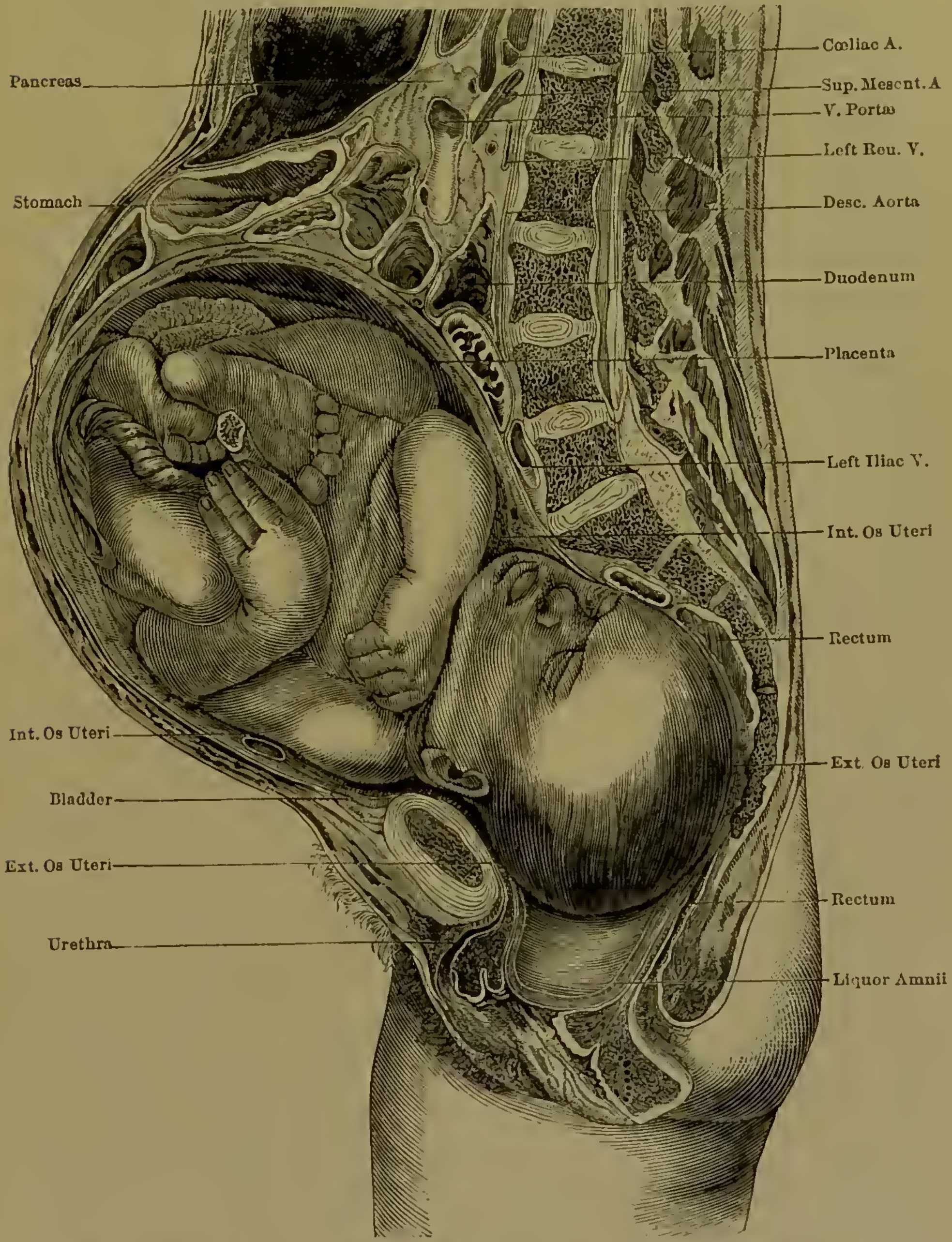
[1] Franz Carl Naegele, professor of midwifery at Heidelberg, essay on the *Mechanism of Parturition*, published in 1818. His son, Herman Franz Naegele, succeeded him in his chair, and wrote an admirable treatise on obstetrical auscultation in 1838.

FIG. 236.



Showing the Position of the Fœtus *in utero*, from a frozen section after labor had begun (C. Braun).

across the sternum, so as to receive, as it were, the chin between the hands. The fœtus, thus folded on itself, constitutes a nearly ovoid mass; the larger extremity, represented by the breech, is turned toward the fundus of the uterus, while the smaller, formed by the head, is directed downward. This ovoid mass is called the fœtal ellipse. Its long diameter is about eleven inches.

This ovoid mass occupies the cavity of the uterus, which is also of a corresponding ovoid shape. The fundus of the uterus at term represents the largest part of the egg. The length of the cavity is about twelve and a half inches; the widest transverse diameter, toward the fundus, is eight inches; while lower down, near the os uteri, the transverse diameter is only four inches.

The normal position of the fœtus in the cavity of the normal uterus is certainly paradoxical and peculiar; and the questions at once suggest themselves, What are the causes of this, the normal, attitude? and, What are the causes of all departures from it?

THE ATTITUDE AND POSITIONS, NATURAL AND PRETERNATURAL, OF THE FŒTUS IN UTERO.

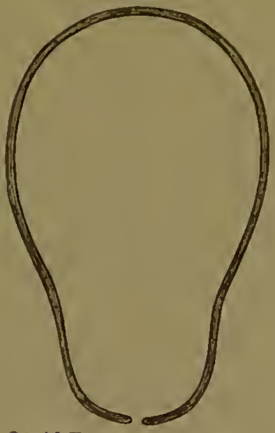
The common opinion formerly was that the normal attitude of the fœtus in utero at term—an attitude which placed it upside down in the uterine cavity—was due to the action of gravity. The theory was that the fœtus, suspended by its cord and floating in the liquor amnii, obeyed the law of gravity, and the head, being the heaviest part, descended to the lowest part of the cavity, while the lighter breech occupied the fundus. This theory certainly is very plausible and seems to explain the fact completely. It has, however, one fatal objection—an objection which applies to many other most specious theories in science and philosophy; and that is, that there is not one word of truth in all of its apparently legitimate assumptions. Each premise is false; each conclusion, therefore, must be equally false. In the first place, the child is not suspended by its cord, since from an early period in gestation the cord is longer than the long diameter of the cavity. Secondly, during the latter months of gestation it does not float in the amniotic cavity, the total amount of liquor amnii at term seldom exceeding one or two pints. Finally, the head of the fœtus at term is not its heaviest part. Any one can readily test this assertion by placing a recent stillborn infant in a tub of water: should this be done, it will be found that, as the body sinks, the back or shoulder will generally reach the bottom first.

Dubois, after proving the worthlessness of this popular opinion, maintained that the true cause of the position of the fœtus in utero was the instinct of the fœtus itself. He held that, in consequence of an unerring instinct, the fœtus assumed that position in the cavity of the uterus which contributed most to the ease and safety of its birth. In this way he explained the position of the fœtus in animals, in which the lowest part of the womb does not correspond with the neck, as in the upright human female, but rather with the fundus; nevertheless, the fœtus in animals generally presents by its head. This theory of Dubois certainly is a great advance over the theory of gravity. Yet, though looking in the right direction toward the truth (which the gravity theory never did), it can scarcely be said to be satisfying.

To Sir James Y. Simpson of Edinburgh belongs the credit of suggesting the only completely satisfactory and scientific theory on this most interesting and important subject—a theory that explains not only the usual position of the fœtus, but also every aberration and exception. In other words, Simpson's theory gives us the clearest explanation of every presentation and position possible for the fœtus in utero. Simpson's paper on this subject is a long one, but will well repay the time spent in reading it. It can be found in the *Edinburgh Monthly Journal of Medical Science* for January, 1849.

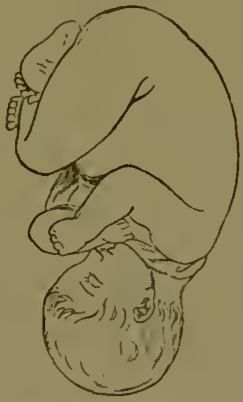
Simpson's theory is that the position of the fœtus in the cavity of the uterus at the full period of gestation is due to the action of several causes. In the first place, it is due to the shape of the *normal* fœtal ellipse at term; secondly, to the shape of the *normal* uterine cavity at term; and, finally, it is due to the automatic or reflex movements of the fœtus (Dubois' instinct), which automatic movements cause the fœtus to assume that position in which its own peculiar shape will accommodate itself to the peculiar shape of the containing cavity, and thus it is enabled to enjoy the greatest comfort and latitude of movement; and it is not only brought into this desirable relation, but it is subsequently maintained in it, by these reflex actions.

FIG. 237.



Ovoid Form of the Uterus.

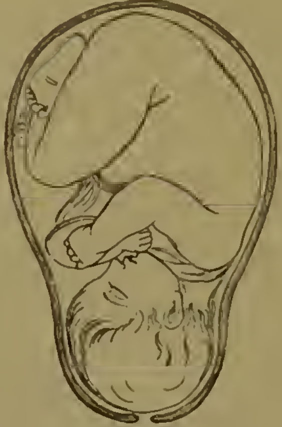
FIG. 238.



Ovoid Form of the Fœtus.

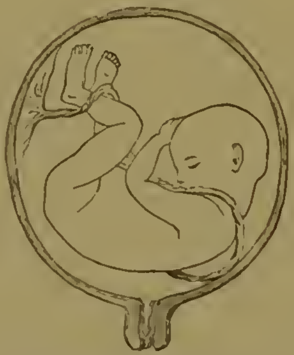
Before the end of the sixth month of gestation the cavity of the uterus is spherical, and not egg-shaped; it contains, relatively, a large amount of amniotic fluid. The fœtus also at this period is not folded up in the peculiar manner that characterizes it at term; it is also comparatively small; that is, its long axis is shorter than the transverse diameter of the uterine cavity; consequently, before the end of the sixth month the fœtus assumes every position that accident or circumstance may occasion—now on its head, again on its side or breech or back or abdomen.

FIG 239.



Adaptation to each other of the Two Ovoids.

FIG. 240.



Spheroidal Shape of Uterus before Sixth Month.

After the sixth month the shape of the uterine cavity *gradually* changes, until at term it presents its characteristic ovoid or pear shape. The amount of liquor amnii relatively decreases as gestation advances. Coincident with these changes the fœtus *gradually* becomes folded up and becomes the ovoid or pear-shaped mass seen at the end of gestation. As the long diameter increases after the sixth month, the child presently can no longer change its position, but its attitude becomes fixed. Now it is gradually brought into this attitude, and maintained in it, by its own automatic movements. The child is uncomfortable in any position save that in which it is least pressed upon. Hence when the alteration in shape of the uterine cavity causes uncomfortable pressure on any part of the fœtal surface, *automatic* struggles ensue (the *instinctive* movements of Dubois), which are kept up until the necessary adjustments are secured. Should any maternal movements cause the proper adjustment to be disturbed, automatic struggles immediately take place, and last until the fœtus again secures a comfortable position.

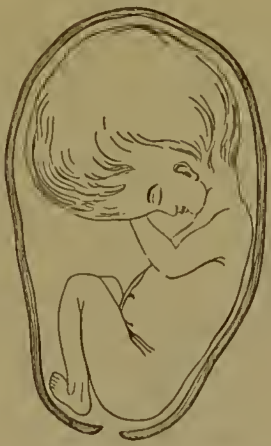
That this theory of Simpson's is the true theory is proved by a great variety of well-known facts. In the first place, all statistics show that in premature labors before the end of the sixth month—in other words, before the position of the fœtus has become fixed—the child offers by any part that may happen accidentally to be at the mouth of the uterus, as by the breech or trunk.

Again, alter any one of the three causing conditions—viz. the shape of the uterus, the shape of the fœtal ellipse, the automatic movements of the fœtus—and the normal position is apt to fail. Thus, the child is placed in its peculiar position by its automatic movements; these movements also maintain it in this position. Hence, if the fœtus should die some time before term, these automatic movements necessarily will be lost; it becomes a mere inert mass, and a malpresentation—depending on the many accidental conditions affecting it prior to and at labor—is often the result.

Dr. Collins' statistics, based on 16,659 cases of labor, show a breech presentation once in every 62 *living* births (1 in 62), but in *putrid* children (children dead a long time before labor, and where, consequently, there were no reflex movements to maintain the normal position) a breech presentation occurred once in every 6 labors (1 in 6). The same statistics show 1 shoulder or trunk presentation in every 555 living children (1 in 555), while, in putrid children, 1 trunk presentation occurs once in every 88 labors (1 in 88).

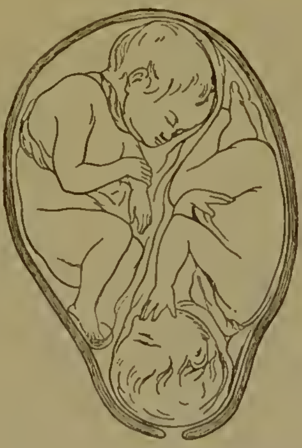
Again, when from disease the *shape* of the fœtus is changed from the normal one, the very causes, which in normal cases secure a normal presentation, will in such abnormal modifications cause an abnormal presentation. Dr. Simpson gives many illustrations, but intra-uterine hydrocephalus forms one of the most striking. In such cases, when the cranial enlargement is very great, the head becomes the largest part of the fœtal ellipse, and consequently the very reflex movements, which in ordinary cases place the larger breech at the fundus, now bring the abnormally enlarged head to the same position. All experience shows that breech presentations are very common in cases of intra-

Fig. 241.



Hydrocephalic Fœtus.

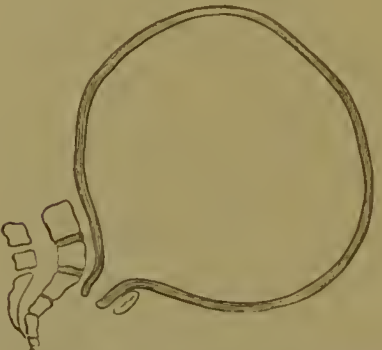
Fig. 242.



The Uterine Cavity Distorted by Twins.

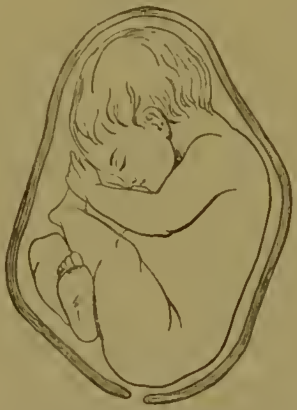
uterine hydrocephalus; and the reason why they are not far more common is that the hydrocephalic enlargement does not take place, to any modifying extent, until after the child has become so fixed in its position that the shifting somersault cannot take place.

FIG. 243.



Abnormal Shape of Uterine Cavity, the result of deformed pelvis (Simpson).

FIG. 244.



A Breech Presentation, the result of abnormal shape of the uterine cavity (Simpson).

Again, in accidental or permanent modifications in the *shape of the uterine cavity* abnormal presentations are very common at labor. In this way we are able to explain the malpresentations occurring in labors complicated by fibroid tumors of the uterus, deformities of the brim of the pelvis, placenta prævia, excess of liquor amnii, and other abnormal conditions.

Thus, cases are reported where the same woman in all of her labors, amounting to six, eight, ten, or more, had the child always presenting by the breech. In such instances undoubtedly there was some marked deviation in the shape of the uterus, in consequence of which its most roomy part was that near the os uteri; and hence the very same causes which usually place the breech at the more capacious fundus, in these exceptional modifications of the uterine cavity place it at the more capacious lower part of the organ.

Cases are reported where the same woman in all of several labors had the child offer by its trunk. In instances of this sort the deformed uterus had for its longest diameter the transverse diameter; consequently the fœtus fitted best and was most comfortable with its long axis corresponding to the long axis of the abnormal uterus in which it was placed, and a trunk presentation was the result.

In addition to these causes of presentation, which we may call the natural causes, there are undoubtedly certain accidental conditions which modify or alter both presentation and position. One of these accidental circumstances is an accident happening to the mother (as a fall) about the time the fœtus is assuming its normal attitude in the uterine cavity in the sixth month; that is, about the time its long axis is almost equal to the transverse diameter of the uterine cavity. Under such circumstances the child may suddenly be turned by the shock, and, unless a shaking up, equalling or exceeding in violence that which has placed it in its uncomfortable position, should happen, it will be compelled to remain in it, in spite of all its automatic struggling, and a breech presentation will be the consequence. I have no doubt that almost every case of breech presentation not due to modifications in shape of fœtus or uterus is the result of accidental causes.

Finally, obliquities of the uterus, before and during labor, are undoubtedly potent accidental factors of many kinds of malpresentation. In such cases the fœtus, though placed normally in the uterine cavity, is urged by the contractions of the oblique uterus, not in the direction of the axis of the superior strait, but more or less obliquely to the plane of the superior strait. Hence the head, in some instances, slips past the pelvic opening entirely, and a trunk presentation is the consequence; or the head, striking on the edge of the superior strait, is arrested, and a malpresentation of the head may result, as a face, or brow, or side of the head.

In summing up this very interesting and important subject, we conclude that the normal position of the normal fœtus in the normal uterus at term is that where the head is at the os uteri; in other words, a vertex presentation is the, strictly speaking, only absolutely normal presentation; that this presentation is due to the causes which we have just studied; that all departures from this presentation are the results of the modifications of the causes occasioning it; and that thus we can explain most clearly and satisfactorily every possible presentation that can offer during labor. The action of these causes, and of others easily understood, enables us readily to comprehend why but two positions of presentation of the vertex are, strictly speaking, normal—viz. the left occipito-anterior and the right occipito-posterior.

The anterior part of the uterine cavity at term is the most capacious and best fitted to the posterior part of the fœtal ellipse, while the posterior wall of the uterus is more or less pressed upon by the projecting lumbar vertebræ, and thus the posterior part of the cavity is best fitted to the anterior plane of the folded fœtus. It is in consequence of these conditions that the child usually offers with its back in front; should, however, from any cause, the cavity of the uterus not present the peculiarities just referred to, but possess a perfect pear-shaped outline, then the back of the child may look in any direction, back or front or to either side. In any event, the presence of the sigmoid flexure of the colon, and the presence of the rectum on the left side, with the accumulations common to them, and the frequent passage of these accumulations, furnish ample reason why the head, whether the back be in front or behind, should be compelled to assume an oblique position at the superior strait, and, consequently, ample reason why in a strictly normal fœtus, in a strictly normal cavity at term, the strictly normal position should be the left occipito-anterior or the right occipito-posterior.

Mechanism of Presentations of the Vertex.

As presentation of the vertex is the normal presentation, we will begin our discussion of the mechanism of labor with the mechanism of vertex presentations.

Authorities differ greatly as to the number of positions to be described in vertex presentations. Some describe only two—viz. the occiput to the left side (first position), and the occiput to the right side (second position). Others describe four, six, and eight positions. Really, the whole matter is an arbitrary arrangement, and, when we have clear ideas on the subject of presentation and position, we may take two or fifty positions (should we prefer to study so many) at the superior strait.

I shall follow the arrangement of Hodge, and shall take six positions at the superior strait. The points of location of these six positions are—the four inclined planes of the pelvic cavity, the symphysis pubis, and the promontory of the sacrum. Some deny the possibility of the positions to the sacrum and pubis. Undoubtedly, they are rare: even when they do exist at the beginning of labor, the posterior projection of the interpubic pad in front and the promontory of the sacrum behind cause the round and smooth head, among the earliest changes of labor, to assume the normal oblique position at the superior strait. Still, these positions sometimes persist, and occasion difficulties which we should recognize.

Following Hodge, we will take six positions of the vertex. Three of these positions have the back of the head turned in front; hence we call them occipito-anterior positions. Three have the back of the head turned behind (occipito-posterior positions).

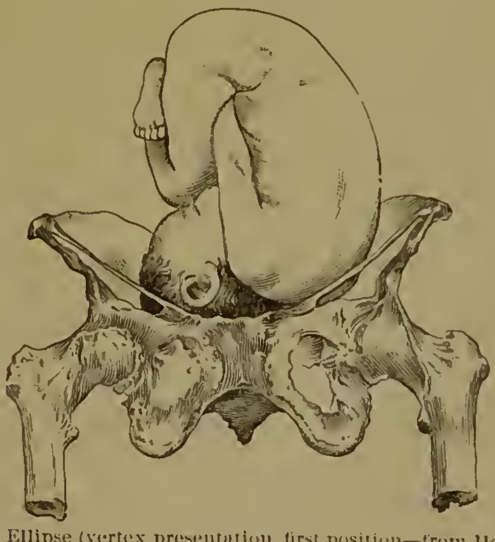
We call that position the *first* which is the most common of all positions—viz. where the occiput is in front and to the left side; the other positions are designated by terms, as is this the first, entirely arbitrary, and which are usually intended to indicate the relationship between the head and the pelvic cavity.

Positions of Vertex Presentations.—First position, left occipito-anterior, occiput to the left anterior inclined plane; second position, right occipito-anterior, occiput to the right anterior inclined plane; third position, occiput to the symphysis pubis; fourth position, right occipito-posterior, occiput to right sacro-iliac symphysis; fifth position, left occipito-posterior, occiput to left sacro-iliac symphysis; sixth position, occipito-sacral, occiput to the promontory of the sacrum.

Mechanism of the First Position.—*Left Occipito-anterior, Occiput looking to any part of the Left Anterior Inclined Plane.*—In this position the back of the child looks in front and to the left, its anterior plane behind and to the right. One hip, one shoulder, one parietal protuberance look in front and to the right side; the others, behind and to the left. In these descriptions I shall not refer to any part as the right or left part, as these designations are always confusing, but as the anterior or posterior part; thus, the anterior or pubic shoulder, the posterior or sacral hip, etc., etc.

Before entering on the description of the changes occurring in the mechanism of the first position of the vertex, it may not be out of place to remark that when the student understands thoroughly the mechanism of labor in vertex presentations he can readily comprehend, without the slightest difficulty, the mechanism of labor in all presentations and positions. Perhaps I can give a clearer idea of my meaning by comparing the mechanism of labor in vertex presentations to a tune, of which tune the mechanism of labor in all other presentations is the same, with variations. If the student shall get the harmonies of this simple (and beautiful?) tune fixed in his memory, he will have little difficulty in adapting the self-evident variations to any presentation offering.

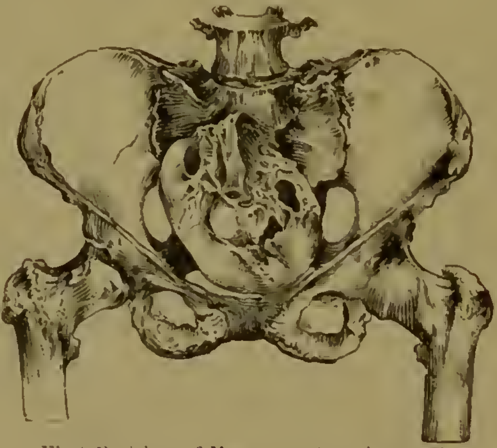
Fig. 245.



Fœtal Ellipse (vertex presentation, first position—from Hodge).

At the superior strait, and before the bag of waters ruptures, the head (in a first position of vertex presentation) offers only *partially* flexed, presenting really the occipito-frontal circumference, with its longer diameter, instead of the cervico-bregmatic circumference. When, however, the bag of waters ruptures and a portion of the liquor amnii escapes, the walls of the uterus come in direct contact with the body of the child and force it down into the pelvic cavity. The head, meeting with resistance, becomes perfectly flexed. This flexion of the head under these circumstances is readily understood when we bear in mind the position of the foramen magnum at the base of the skull—that it is behind the centre; hence that portion of the head anterior to the spinal articulation represents the long arm of the lever, and when an equal force of resistance is applied to the anterior and posterior portions of the head, flexion must result; and this flexion becomes perfected as the resistance increases, until a complete vertex presentation is secured, and the cervico-bregmatic circumference fairly offers to the diameters of the superior strait or cavity of the pelvis. Hence the first effect of uterine contractions after dilatation of the os is to complete the flexion of the head, and thus the first effect of uterine contraction is to perfect the fœtal ellipse.

Fig. 246.



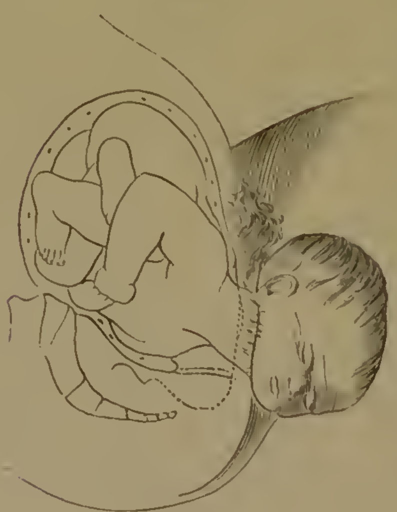
First Position of Vertex at Superior Strait.

We may call the flexion, thus secured, *adaptation*, since it causes the fœtal ellipse to offer its most favorable diameters to those of the pelvis. When we come to study the mechanism in other presentations we shall see an attempt to secure similar results in every instance. In other words, Nature's first effort seems to be to attempt to bring the presenting part to offer, if possible, by its smallest and most favorable diameters. The first effect, then, of uterine contractions, after dilatation of the os, in all presentations, is *adaptation*, and *adaptation* in vertex presentation, as we have seen, means *flexion*.

The second effect is to force the head to engage and descend, with the plane of its presenting diameters (*more* or *less*) parallel, when at the superior strait, with the diameters of the plane of the strait. Hence we have the cervico-bregmatic diameter (3½ inches) *more* or *less* in relation with the left oblique (5 inches), while the biparietal diameter (3½ inches) is *more* or *less* in relation with the right oblique diameter (5 inches). Here, in order to avoid future misconception, we will designate the oblique diameter, measured from the left acetabulum to the right sacro-iliac symphysis, the *left oblique diameter*, and the diameter measured from the right acetabulum to the left sacro-iliac symphysis the *right oblique diameter*. The expression "the cervico-bregmatic diameter in one oblique, and the biparietal diameter in the other oblique," though sufficiently accurate for the purposes of description, is not absolutely so. Thus, for example, the posterior pole of the biparietal diameter may be in relation with any part of the left posterior inclined plane, the anterior pole necessarily bearing corresponding relations with the right anterior inclined plane; hence the relationships of diameters may vary, and we may have 3½ inches offering to the oblique (5 inches) or the transverse (5¼ inches). Moreover, the cervico-bregmatic circumference is not mathematically parallel with the plane of the superior strait: the head actually engages and descends somewhat obliquely, so that the anterior parietal protuberance is a little lower than the posterior. While admitting this to be the mathematical fact, yet for all practical purposes, as well as for the convenience of description and illustration, we shall assume the head as offering fairly the plane of the cervico-bregmatic circumference to the plane of the superior strait. The head thus forced to engage (3½ inches in each direction), offering to 5 or 5¼ inches, meets with no obstruction, and readily descends into the cavity and reaches the floor of the pelvis, the occiput playing on the left anterior inclined plane, and the forehead looking toward the right posterior inclined plane. Reaching the floor, the occiput can move no longer in the direction of the axis of the superior strait; it is arrested in that direction by the floor, and a new movement takes place; which movement we call *rotation*. The smooth, round occiput, meeting the smooth inclined pelvic surfaces, slides downward, forward, and inward, until at last the nape of the neck gets beneath the arch of the pubis, and the forehead and face look toward the hollow of the sacrum.

We may notice the diameters now offering to the diameters of the inferior strait—the cervico-bregmatic to the antero-posterior (3½ inches to 4½ inches); the biparietal to the transverse (3½ inches to 4 inches), the occipito-mental, *more or less* exactly, corresponding to the axis of the strait. While the head has rotated, the body of the child, still in the cavity of the uterus, has been tightly grasped by the firmly-contracted walls of the uterus, and has not participated in the movement of the head; hence the shoulders are still oblique at the superior strait, and consequently the neck of the child is twisted. The expelling forces still acting, the occiput gets well beneath the arch of the pubis, and the back of the neck is pressed firmly against the inner face of the symphysis. The head is arrested, since a further advance of the occiput is impossible. A new movement now ensues, called *extension*. Until the moment of arrest, the occiput, in consequence of the complete flexion of the head, has received, through the spinal column, almost directly the whole force of the expelling powers. Now, being locked beneath the symphysis, its further advance is impossible, and the chin, the only part of the head that can move, under the influence of the very forces that until now caused the occiput to descend, leaving the breast of the child, against which it has been more or less pressed, sweeps through the concavity of the distending soft parts, the nape of the neck resting on the subpubic ligament as a point of support, while the chin and face describe round it, as extension proceeds, the arc of a circle from the coccyx to the fourchette, the radius of which arc is the cervico-frontal diameter (the cervico-frontal diameter, 4 inches, reducible to 3½ inches); while the occipito-mental diameter, during the whole process of extension, is more or less on a line with the axis of the canal of the distended soft parts. Finally, when extension is completed, the head is turned up in front of the symphysis, the occiput resting on the lower part of the mons. As the head passes through the inferior strait, and until its final escape, the soft parts at the outlet —*i.e.* the perineum—become enormously stretched, enough to cover the whole head. Resistance increases until the parietal protuberances pass —in other words, until the cervico-frontal circumference escapes. At this moment the anterior border of the perineum, in consequence of its own elasticity and the contraction of its muscles, slips over the face and embraces the neck. The head until this moment has been held up strongly by the distended soft parts against the mons Veneris; now, freed from their grasp, it falls by its own weight, the chin going to the anus. As soon as the head is born and free to move, the neck untwists itself, the head resumes its natural position, and consequently assumes an oblique position, the occiput going to the left groin and the chin to the right tuberosity of the ischium. This untwisting of the neck is called *restitution* or *exterior rotation*.

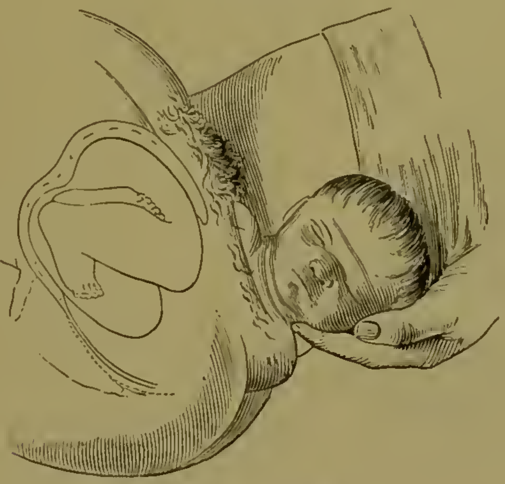
FIG. 247.



Restitution.

The head being now delivered, the shoulders descend, the bis-acromial diameter (4 inches) more or less nearly in the right oblique (5 inches), the dorso-thoracic (3 inches) in the left oblique, the long axis of the trunk more or less in the axis of the superior strait. The large head having passed, there is no resistance. The anterior shoulder sinks down along the right anterior inclined plane, the posterior along the left posterior inclined plane. Presently the shoulders reach the floor of the pelvis; now, as in the case of the occiput, they can advance no farther in the direction of the axis of the superior strait, and the movement which we have called rotation takes place. Under this movement the anterior shoulder sweeps over the right anterior inclined plane, and finally gets under the arch of the pubis. This rotation of the shoulders now places the head *transverse* at the outlet. The anterior shoulder becomes locked behind and under the arch, while the posterior shoulder distends the soft parts and describes round the anterior shoulder, resting on the subpubic ligament as a point of support, the arc of a circle from the coccyx to the fourchette, the radius being the bis-acromial diameter.

Fig. 248.

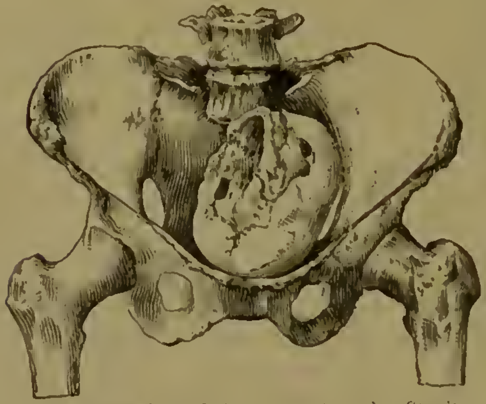


External Rotation.

Although the pubal shoulder appears first beneath the arch, circumstances determine which shall be born first. Thus, if the perineum be relaxed, as in women who have borne children, or where laceration has occurred in former labors, the sacral shoulder escapes first; but if the perineum be rigid, as in first labors, the sacral shoulder is retained until after the pubal shoulder is born. When the shoulder is under the arch the child's body is strongly flexed. Generally, after the birth of the shoulders, the stretched parts offer no resistance to the rest of the body, which is expelled, practically, without a mechanism. But we may suppose a theoretical case where the hips of the child are very large and fat, and where there is, consequently, some detention. In a theoretical case of this kind there *might* (?) be a twist in the loins of the child, and there *might* (?) be, in consequence, after the expulsion of the shoulders, an untwisting of the loins, the shoulders assuming an oblique position at the vulva (*restitution* of the shoulders). The hips then would descend precisely as the shoulders had done; they *might* (?) even rotate, so as to bring the anterior hip beneath the arch, and in this relation be expelled.

MECHANISM OF THE SECOND POSITION.—*The Second Position of the Vertex, the Right Occipito-anterior Position.*—In this position the occiput looks to any part of the right anterior inclined plane. In the second position we have precisely the same diameters involved as in the first position, with an identical mechanism.

FIG. 249.

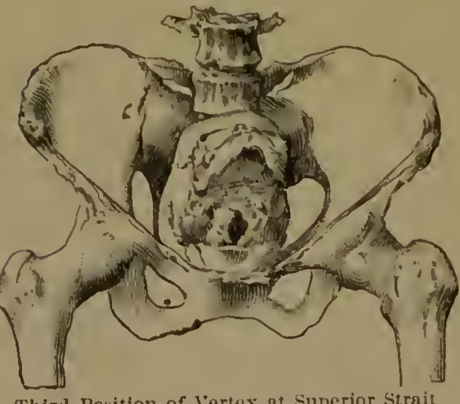


Second Position of Vertex at Superior Strait.

The presence of the rectum on the left side, if distended, might interfere with the easy rotation of the face into the hollow of the sacrum. In the second position the occiput rotates to the pubis on the right anterior inclined plane, just as it rotated, in the first position, on the left anterior inclined plane. The delivery of the body in the second position, is also exactly similar to the delivery of the body in the first position.

MECHANISM OF THE THIRD POSITION.—*Third Position, Sacro-pubic.*—In this position the occiput looks directly in front. The third position is rare: some authorities deny it entirely. Our remarks on the causes of presentation and position explain its possibility, however. Even when existing at the beginning of labor, the occiput playing on the projecting interpubic pad, and the forehead on the round promontory of the sacrum, almost necessarily cause the third position to become spontaneously converted into a first or a second position. Should this spontaneous conversion not occur, there would be the following mechanism.

FIG. 250.



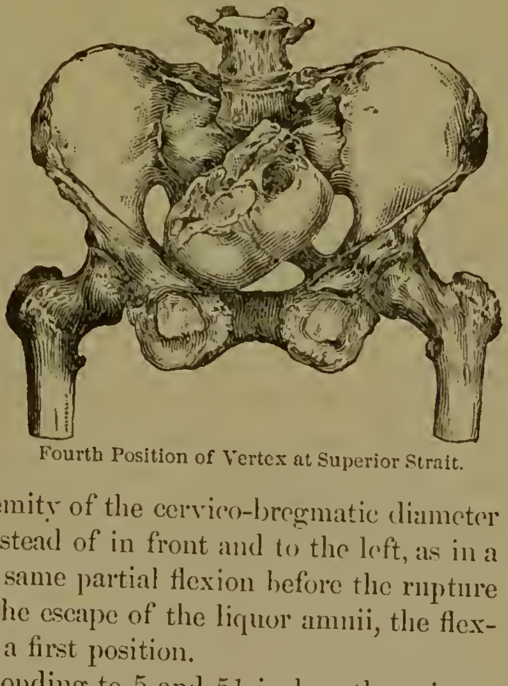
Third Position of Vertex at Superior Strait

The great difficulty would be at the superior strait. What is essential is that the cervico-bregmatic circumference should fairly offer at the superior strait. If the head is not perfectly flexed, there will offer the occipito-frontal circumference. The occipito-frontal diameter is 4 inches; the antero-posterior diameter of the superior strait is 4 inches: 4 inches cannot pass through 4 inches, consequently the head will be arrested at the superior strait. When, however, the head is *perfectly* flexed at the superior strait, the cervico-bregmatic diameter, 3½ inches, offers to the antero-posterior diameter of the strait, 4 inches. There is no difficulty, and the head readily engages and descends, the occiput sinking directly behind the symphysis pubis, and finally getting beneath the arch. Extension then follows, as in the first and second positions. As there has been no rotation of the occiput, there is no twist in the neck of the child, and hence when the head is born there is no restitution. The shoulders now engage transversely, the bis-acromial diameter (4 inches) offering to the transverse of the superior strait (5¼ inches). They descend and reach the floor of the pelvis: rotation may or may not take place; if it should take place, accident determines which shoulder shall rotate in front; after this movement the body is expelled as in other cases.

OCCIPITO-POSTERIOR POSITIONS.—*Fourth Position, Right Occipito-posterior Position.*—The fourth position is the reverse of the first position, the occiput looking to any part of the right posterior inclined plane. In this position the anterior plane of the child looks in front and to the left; the back of the child, behind and to the right. One hip, shoulder, and parietal protuberance look in front and to the right side; the opposing hip, etc. look behind and to the left.

The relations, at the superior strait, of the head to the brim, in a fourth position, are identical with those we studied as characterizing the first position, save that the occipital extremity of the cervico-bregmatic diameter looks behind and to the right, instead of in front and to the left, as in a first position. We have also the same partial flexion before the rupture of the bag of waters, and, after the escape of the liquor amnii, the flexion of the head completed, as in a first position.

FIG. 251.



Fourth Position of Vertex at Superior Strait.

As we have 3½ inches corresponding to 5 and 5¼ inches, there is no difficulty at the superior strait. The head descends as in a first position, and reaches the floor of the pelvis. Here, as in a first position, it is arrested, being unable to advance any farther in the direction of the axis of the superior strait, and labor may terminate in one of three ways.

In the vast majority of cases, the mechanism scarcely differs from that described for the first and second positions; that is, the head, having reached the floor of the pelvis, undergoes a movement of rotation, in consequence of which the occiput traverses the whole right lateral half of the cavity from behind forward, and ultimately gets beneath the arch of the pubis. In other words, a fourth position of the vertex—a right occipito-posterior position—in the vast majority of instances, terminates as if it had been a primitive second position or a right occipito-anterior position. In some cases this anterior rotation of the occiput does not take place. These cases, however, are exceedingly rare. Naegele only met 17 exceptions, in 1244 cases of occipito-posterior positions, where the occiput failed to rotate to the pubic arch. In all of these exceptional instances it was not difficult to recognize the unusual circumstances which caused the failure in anterior rotation. These unusual circumstances were "an amplitude of the pelvis, or numerous former labors; lacerations of the perineum, or the softness, flexibility, reductibility, and want of consistency of the head, or an extreme smallness of the child; the presence of twins, etc. etc."

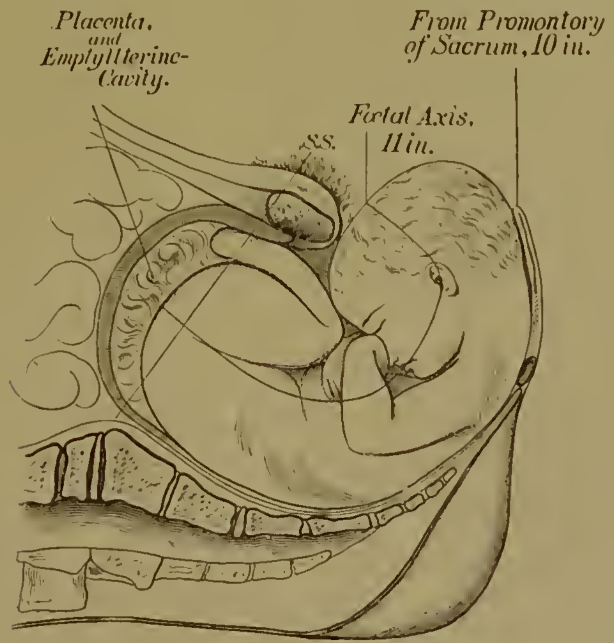
In cases where the occiput, from any cause, does not rotate in front, it rotates back into the hollow of the sacrum, and the top of the forehead gets *behind* the symphysis pubis. This posterior rotation of the occiput, even in the most favorable cases, is always undesirable: the easiest case is always more difficult, painful, and dangerous, both to mother and child, than if anterior rotation had occurred. But, in some instances, the rotation of the occiput into the hollow of the sacrum furnishes some of the grave cases in obstetrical surgery, compromising the lives of mother and child, and demanding the clearest judgment, a thorough appreciation of the mechanism of labor involved, and a willingness to accept responsibility, unfortunately, not always or often met with.

If I were to be asked what one obstetrical difficulty, in my experience, had caused most maternal and fœtal deaths, what one had caused most maternal and fœtal accidents not necessarily fatal—accidents, however, often making the rest of life worthless, or, still worse than merely worthless, a tragedy—I think I would say, "Occipito-posterior positions where the occiput had rotated into the hollow of the sacrum, and which had been *improperly treated.*"

Authorities differ as to the mechanism of these cases, and I must refer the reader to the ordinary textbooks for the several opinions held. I shall give only my own views as to the cause of the difficulty.

A glance at the pelvic cavity will show that in *occipito-anterior* positions the occiput has but, comparatively, a very short distance to traverse from the superior to the inferior strait before it escapes from the pelvic cavity. Thus, directly in front, the depth of the pelvic cavity is only one and a half inches, and even the greatest depth at the sides is only three and a half inches. How great is the difference between either of these distances and that which the occiput is compelled to pass over when it has rotated into the hollow of the sacrum! The depth of the bony pelvis from the promontory of the sacrum to the point of the receded coccyx is five inches, and if we add five inches more to these five inches, as the measure of the distended perineum, we find that the distance which the occiput has to travel from the promontory of the sacrum to the anterior edge of the distended perineum is ten inches, more or less. The length of the back of the child's neck is one and a half inches; and this is quite sufficient in occipito-anterior positions, after rotation has taken place, to reach from the superior to the inferior strait; so that in occipito-anterior positions the body of the child remains in the cavity of the uterus, distending it, and the shoulders are at the superior strait, until the head is almost or quite expelled. In other words, in occipito-anterior positions, in consequence of these conditions, the cavity of the uterus is distended, and the walls of the

Fig. 252.


Placenta, and Empty Uterine-Cavity.
From Promontory of Sacrum, 10 in.
Fœtal Axis, 11 in.
S.S.

Showing Impaction of Fœtal Mass in Vagina, when occiput goes into hollow of sacrum.

organ are capable of exerting their maximum expelling force until the head—the great difficulty of labor—is born. After the head has escaped from the vulva, the shoulders descend into the pelvis, and the cavity of the uterus becomes more and more empty, its expelling powers, consequently, correspondingly more and more feeble; but here the loss of power is of no consequence, since the large and hard head in its passage, under the influence of the maximum forces of labor, has so stretched the perineum and all the external soft parts that they offer little or no resistance to the subsequent escape of the rest of the body.

Should, however, the occiput rotate into the hollow of the sacrum instead of to the pubis, all of these favoring circumstances are lost. The distance the occiput has to traverse from the promontory of the sacrum to the edge of the distended soft parts is, as we have just seen, ten inches; but the length of the back of the child's neck is one and a half inches—less than one-sixth of the whole distance to be passed. Hence, before the occiput can reach the anterior edge of the perineum and be born, the shoulders and whole body of the child must be jammed down into the cavity of the pelvis, until, finally, the pelvis becomes impacted with the fœtal mass. But the whole length of the uncompressed fœtal ellipse is only eleven inches; hence, before the occiput can escape, the whole eleven inches of fœtal ellipse must be packed into the cavity of the pelvis. This necessarily implies that the cavity of the uterus in these cases becomes practically empty, and therefore the uterine expelling power is practically lost—practically lost long before the delivery of the head is possible; lost, too, under conditions where the maximum expelling powers would be most desirable if they could be brought to bear. We have, then, in these cases, the obstruction and difficulty increasing, while the powers diminish, until, long before the head is delivered, the uterine powers have been lost completely, and the impacted pelvis can be *naturally* emptied of the obstructing mass *only* by the bearing-down, voluntary efforts of the unfortunate mother. Is it to be wondered at, that, with such a combination of adverse conditions, posterior rotation of the occiput should, at times, furnish some of the gravest and saddest cases in obstetrics?

This explanation enables us to understand how, sometimes, in these cases, delivery with the forceps is simply impossible, and why, when this instrument is injudiciously used, it becomes such a potent cause of death both to mother and child.

In contemplating the mechanism of labor in these cases, it is evident that Nature frequently cannot accomplish the delivery. Should, however, the case terminate spontaneously, the mechanism would be as follows: The head would become greatly flexed, almost or quite at right angles to the spine (and this extreme flexion implies great loss of expelling force, which is wasted on the anterior face of the sacrum).

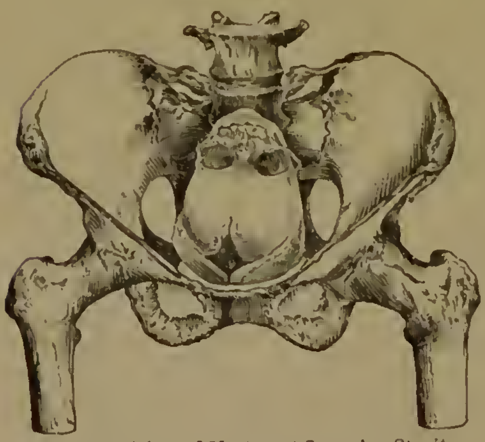
The whole fœtal ellipse becomes jammed down into the cavity of the pelvis. The uterine power is gradually lost. The perineum becomes greatly distended, and laceration is most common. Finally, the head is expelled by the *voluntary bearing-down* efforts of the mother. The occiput glides over the edge of the distended perineum, and the forehead and face appear under the arch of the pubis. The head becomes more and more flexed until the cervico-frontal circumference escapes. At this instant the perineum slips up along the back of the child's neck, and the head is rapidly delivered by a process of *extension* backward, the nape of the neck resting on the edge of the perineum, and the forehead and face appearing under the arch of the pubis. An arc of a circle is described, as the head extends back, with the nape of the neck resting on the edge of the perineum as a pivot, the radius being the cervico-frontal diameter. As soon as the head is delivered, the shoulders and body follow, very much as already studied in occipito-anterior positions. But it must be recollected that the shoulders have been jammed in the pelvic cavity for a long time, and that, hence, restitution of the escaped head and subsequent rotation of the shoulder are less likely to happen.

We have stated that labor, in the fourth position, after the head has reached the floor of the pelvis, might terminate in one of three ways. The third way is very rare. In these cases the occiput reaches the floor of the pelvis and becomes caught or fastened on some abnormal projecting surface or point, in such a manner that anterior or posterior rotation becomes impossible. The chin now leaves the breast of the child and sinks behind the pubis, and ultimately the case terminates as a face presentation of a mento-anterior variety. In a case of this sort, we may suppose the occiput arrested, and its further advance rendered impossible by some cause or other: a long and hooked spinous process of the ischium could furnish such an obstruction. It should now be called to mind what takes place in every case of labor, in an occipito-anterior position, when the occiput gets locked beneath the arch of the pubis. The opposite extremity of the head, the chin, as the only part free to move, under the force of the expelling powers, leaves the breast of the child, and the head extends; and this is precisely what we have taking place in these very rare cases. The occiput becomes arrested; it can advance no farther; it can rotate neither forward nor backward; and, finally, the chin, as the only part of the head free to move, leaves the breast of the child, and the head extends, and the labor terminates as a face presentation. The occipito-mental diameter of the head is 5 inches, the oblique diameter of the cavity is 6 inches; hence this extension of the head is entirely possible.

FIFTH POSITION.—*Left Occipito-posterior Position.*—The fifth position is the reverse of the second position, and bears the same relation to it that the fourth bears to the first. The position of the rectum, if not empty, might interfere; if empty, the case is identical in its mechanism with that of the fourth position, which we have just studied. The fifth position, for reasons already studied, must be exceedingly uncommon.

Sixth Position.—*Occipito-sacral.*—The sixth position is the reverse of the third. The relationship of diameters with the diameters of the brim is precisely the same as that which we have already studied in the third position. The existence of the sixth position is denied by most authorities. There is no doubt, however, that it sometimes happens, and, as we shall see, is by far the most undesirable of the occipito-posterior positions. In a sixth position the occiput looks directly to the promontory of the sacrum. Early in labor the smooth back of the head, playing on the smooth and round promontory of the sacrum, causes the head to assume an oblique position at the superior strait; in other words, causes an *apparent* fourth or fifth position. The medical attendant, conducting his examinations, diagnoses a fourth or fifth position, and does not realize that the position is apparent and not real, and that the back of the child is still looking directly to the back of the mother, and that there is a twist in the neck. As soon as the head has passed the brim—much sooner than in a primitive fourth or fifth position, in which rotation occurs ordinarily only when the head reaches the pelvic floor—the neck untwists and the occiput is thrown into the hollow of the sacrum. In other words, the occiput, in a sixth position, *never rotates to the front, but always goes into the hollow of the sacrum.* Hence a sixth position is the most difficult of all the occipito-posterior positions.

Fig. 253.



Sixth Position of Vertex at Superior Strait.

Should the head, in a sixth position, fail to assume the oblique position at the superior strait that, we have just seen, it must almost necessarily do, but remain with the occiput looking directly to the promontory of the sacrum, then the identical conditions and difficulties would exist which we have already studied in a third position, when the head did not spontaneously assume an oblique position at the superior strait; that is, the cervico-bregmatic diameter (3½ inches) would be in relation with the antero-posterior diameter of the superior strait (4 inches). Hence, if perfect flexion existed the head would pass and sink into the hollow of the sacrum, and labor would terminate as we have just described. Should, however, the head be only partially flexed, the occipito-frontal diameter (4 inches) would offer and the head would be arrested.

In describing the mechanism of labor, and the various movements and changes occurring during the process, it has been necessary, in order to give an accurate idea of these several movements, to speak of them as taking place successively. Thus we have stated that first we have adaptation (flexion in vertex presentation); then descent; then rotation, etc. etc. Now, really, these movements do not always occur in the exact order described. Thus it often happens that the head does not flex perfectly before it descends into the cavity of the pelvis, complete flexion failing to take place until the head encounters the resistance at the floor of the pelvis, and then only, in the great majority of cases, is flexion carried to its highest degree. This we can readily understand when we bear in mind that the diameters of the superior strait, when the head offers in any of the four oblique positions, are so large (5 and 5¼ inches) that there is no resistance whatever (the cause of flexion) until the head reaches the floor.

Again, we say, "First, flexion; then descent; then rotation, etc. etc." Actually, however, in many cases rotation begins before descent is completed, the first three changes of flexion, descent, and rotation being coincident movements. Again, in some instances, the occiput does not rotate completely, and the head is born by a process of extension, the nape of the neck resting, not beneath the symphysis pubis, but against the ischio-pubic ramus. Finally, in some cases the head does not rotate at all, but is delivered by a process of extension, the nape of the neck resting on one tuberosity of the ischium, and the face appearing, as the head extends, at the opposite one. This movement of rotation certainly is a very interesting one. We have seen in all positions, save the sixth, the almost universal result is anterior rotation of the occiput. The question naturally suggests itself, "What is the cause of rotation?" The usual explanation is that rotation is caused by the inclined planes of the pelvis—that if, in a vertex presentation, the occiput strike on an *anterior* inclined plane, it *must* rotate to the symphysis pubis; if it strike on a posterior inclined plane, it *must* rotate into the hollow of the sacrum. Dubois, denying the influence of the inclined planes, maintains that "the cause evidently resides in a combination of a great number of elements—viz. on the one hand the size, form, and mobility of the parts which are expelled, and, on the other, the capacity, the shape, and the resistance of the canal traversed by them;" which, he says, "render all this very simple and intelligible." The reader may decide for himself how "simple and intelligible" Dubois' theory is.

The usual explanation of rotation, that it is caused by the influence of the inclined planes of the pelvis, undoubtedly has some truth in it.

That is, it must be admitted that rotation occurs in consequence of the peculiar shape and direction of the pelvic canal, and that if the pelvic canal were of different shape and direction different results would take place. Yet the inclined-plane theory, or the theory of Dubois, is not satisfactory. Each fails to give a clear and definite idea of the precise cause of rotation as well as the precise cause of the various exceptions and anomalies to which I have referred. Thus, for example, we have seen that, in most cases, the head does not *begin* to rotate until it has reached the floor of the pelvis. But we also know that, in some instances, rotation begins the moment the head enters the superior strait and at the very beginning of labor, while, finally, in others, rotation does not take place at all, or does so only imperfectly. And yet, in all of these varied movements, the head has played on those inclined planes which, we are assured, are the cause of rotation. Why, then, if the same causes are acting in every instance, do we meet with such different results? Why does rotation take place? and why does it not take place? or why does it take place only partially? The inclined-plane theory, or the theory of Dubois, is not comprehensive enough to meet the question.

The only really entirely satisfactory explanation of the cause of this movement of rotation, with all the anomalies and exceptions to which I have referred, is that suggested by Cazeaux. Cazeaux's theory is as follows: The expelling forces of labor act, as we know, in the direction of the axis of the superior strait. The child in labor is urged in this direction. Take the fourth position of the vertex as an illustration. The head descends in the line of the axis of the superior strait; presently it reaches the obliquely-inclined surface of the right posterior part of the pelvic cavity, and is arrested. The occiput is now placed under the influence of two forces—the force of expulsion, which we may represent by a line drawn in the direction of the expelling forces; that is, from above downward, from before backward, and slightly from left to right; and the force of resistance, which force we can represent by a line drawn perpendicularly to the obliquely-inclined surface on which the occiput strikes, and which arrests its further progress in the line of the axis of the superior strait. This force of resistance, then, is a force acting in the direction of a line drawn from behind forward and from below upward.

The child's occiput is, then, from the moment of contact with the floor of the pelvis, placed under the action of two forces, the one urging it down, back, and to the right; the other urging it forward and upward.

If the reader will now turn to any work on Physics, he will find this proposition:

When a body free to move is acted upon by two forces, it moves in the *direction of neither of these forces, but in the direction of their resultant; which resultant is the diagonal of a parallelogram of which these two forces form two sides.*

When two sides and the included angle of a parallelogram are given, all that is necessary to complete the figure is to draw lines parallel to the given sides, and the direction of the resultant diagonal is at once revealed.

Hence the occiput, acted on by the two forces, moves in the direction of neither, but in the direction of their resultant diagonal; that is, it moves, in this particular position employed as our illustration, forward, downward, and to the right; which movement presently brings it to the arch of the pubis. This theory of Cazeaux enables us to understand how the extent of this progress of the occiput and the rapidity of its execution are always proportionate to the energy and duration of the expelling forces and the resistance offered by the pelvic floor. It also explains why rotation, after being a long time delayed, is sometimes suddenly and completely effected by one violent pain; and also why, when the pains are feeble and short, the anterior rotation takes place much more slowly. This theory enables us to explain those differences noticed in rotation as to the part of the cavity where it commences. Thus we have seen that it usually begins only when the head reaches the floor of the pelvis. This we would expect, since until then the flexed head has encountered no resistance whatever. But should the head be large, or the pelvis rather small, or the superior strait be much inclined, or the uterus oblique, resistance would be offered as soon as the head engaged, and the head would be compelled to describe the diagonal or resultant movement.

We can now easily understand why, in some cases of occipito-anterior position, rotation takes place only partially, and why in some cases it does not take place at all. When only partial rotation occurs, it is because the head is small, or the pelvis capacious, or the soft parts relaxed, or all of these conditions are combined; and the result is that the force of resistance is not sufficient to impress a complete diagonal or resultant movement on the occiput, and only partial rotation is possible. Similar conditions, intensified, explain cases where there is no rotation whatever. Here there is no force of resistance at all; hence no attempt at a diagonal or resultant movement is made, and the head escapes from the inferior strait in the same position it entered the pelvis.

This theory enables to understand why, in the oblique occipito-posterior positions of the vertex, the occiput in very rare cases goes into the hollow of the sacrum instead of rotating beneath the arch of the pubis. Naegele states that out of 1244 cases of occipito-posterior positions, in all save 17 the occiput finally rotated to the front; and in these 17 rare cases it was easy to appreciate the exceptional causes that occasioned the unusual result. These causes were the small size of the fœtus or of its head, or the great size of the pelvis, or conditions which caused the soft parts to offer no resistance; in other words, in all of these 17 exceptional cases the unusual conditions were such as took away all force of resistance; hence there was no diagonal movement impressed on the occiput when it reached the floor of the pelvis, and the propelling forces, acting in the line of the axis of the superior strait, pushed it into the hollow of the sacrum.

DIAGNOSIS OF VERTEX PRESENTATIONS.

Before labor, and even during the last few months of gestation, the vertex can often be recognized as presenting; while in every other presentation, the part that offers first, save in breech presentations, when the lower extremities are extended and in close contact with the anterior plane of the child, from being irregular, voluminous, and badly adapted to the form of the inferior uterine segment and of the superior strait, is always so high up, and separated from the uterine wall by so large a quantity of waters, as to be scarcely accessible to the finger.

The vertex, on the contrary, presenting a rounded spheroidal surface, reposes, almost without the intervention of any liquid, on the uterine walls, and even presses them before it and engages in the excavation, descending in some cases as low down as the floor of the pelvis. Hence, whenever the vertex presents it is easily detected through the inferior portion of the uterine wall, unless, indeed, it should be retained at the superior strait by a considerable inclination of the womb, or by some unusual condition, as in twins, or by some abnormal condition either in the fœtus or uterus or pelvis.

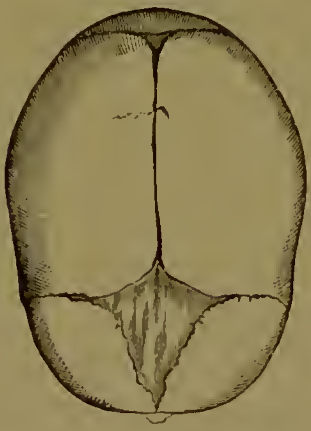
It should, therefore, always be remembered that whenever the medical attendant does not easily reach the presenting part in the last few days of gestation, and more particularly during the first periods of labor, he should examine the woman very carefully; for it is then exceedingly probable that the head is not at the superior strait; or even where the cephalic extremity does present flexed there is reason to fear a wrong direction, or perhaps a vicious organization, of the head or pelvis; all of which circumstances may subsequently require the intervention of his art.

The form of the uterus is, then, such as we have described as normal, some modifications, however, being observable in occipito-posterior positions. Thus, the womb is still widest at its upper part, but its fundus is not so regularly rounded, unless it should contain a large quantity of fluid; generally the fundus has an arched appearance, whilst beneath it is a sensible depression. The anterior plane of the fœtus being directed forward, the inequalities produced by its extremities are perceptible, which is not the case so distinctly in the occipito-anterior positions.

Auscultation is a resource of great value in establishing the diagnosis. In vertex presentations the pulsations of the fœtal heart are heard in one of the iliac fossæ—the left when the occiput is turned to the left, and the right in the opposite case. Again, let it be borne in mind that the active fœtal movements felt by the mother at the same part of the abdomen for a long time indicate the correspondence of this point with the anterior region of the child.

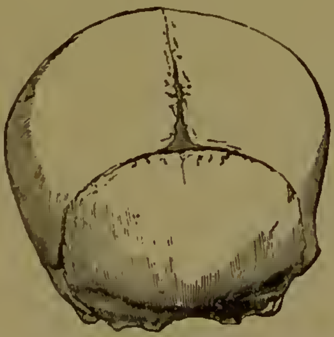
Supposing the labor has begun, if the finger be introduced through the cervix uteri, it will immediately encounter a rounded, smooth, and resistant surface, which is the anterior side of the head; and then, by directing the index a little farther upward and backward, in the direction of the sacro-vertebral angle, it will come into contact with a membranous interval; that is, with the sagittal suture.

FIG. 254.



Anterior and Posterior Fontanels.

FIG. 255.



Biparietal Diameter, Sagittal and Lambdoidal Sutures, with Posterior Fontanel.

A vertex presentation is now ascertained, and the next step is to make out the position. For that purpose we first assure ourselves of the direction of the suture, and if it prove to be oblique, running from before backward and from the left toward the right, the position must either be the left occipito-anterior or the right occipito-posterior one; but, on the contrary, if it be oblique in the other diameter, the position will either be the right occipito-anterior or the left occipito-posterior.

The direction being once determined, we have then only to find out where the occiput lies to complete the diagnosis; therefore, the finger by raising up the margin of the os uteri follows the sagittal suture until it reaches a fontanel.

THE TREATMENT OF VERTEX PRESENTATIONS, BASED ON THE MECHANISM.

It is evident from our study of the mechanism of labor in vertex presentations, that the mechanism of the first position is the easiest and simplest form of mechanism possible, as, fortunately, it is the most common. The treatment, therefore, of labor when the child offers in the first position of the vertex is the treatment demanded in ordinary natural labor, and requires no further comment.

SECOND POSITION.—*Right Occipito-anterior Position.*—In the second position rectal accumulations might interfere with the descent and rotation of the head. A suitable enema would remove these, when the case would need only the treatment of natural labor.

THIRD POSITION.—*Occipito-pubic.*—We have seen that a third position usually becomes spontaneously converted into a first or second at the beginning of labor. The indications then are to favor this spontaneous conversion at the superior strait. This may generally be done by the finger acting on the forehead, so as to force the head into an oblique position. In a more difficult case the whole hand might be introduced, the head be grasped, and *during the absence of pains* gently pushed slightly up and loosened and placed in an oblique position, or the forceps could be applied and the same kind of manœuvre practised. Finally, in any instance where the head cannot be made to assume an oblique position at the superior strait (though a case of the kind must be considered almost a theoretical one), it will be necessary to secure perfect flexion of the head by the aid of the finger, hand, lever, or forceps. As soon as the cervico-bregmatic diameter (3½ inches) is made to offer to the 4 inches of the antero-posterior diameter of the superior strait, the head will pass without difficulty. In an occipito-pubic position, should the shoulders come down transverse, labor will be rendered easier by favoring rotation by pushing one shoulder into the hollow of the sacrum.

FOURTH POSITION.—*Right Occipito-posterior Position.*—Fortunately, as we have seen, the oblique occipito-posterior positions in almost every instance terminate by anterior rotation of the occiput. Nevertheless, even when this most desirable movement takes place spontaneously, the struggle between the forces of propulsion and resistance is always greater than in primitive occipito-anterior positions—usually, immensely greater. Consequently, labor is longer, more painful, and more dangerous to both mother and child. Hence most authorities advise that anterior rotation should be assisted, and thus the struggle be made shorter and less painful. Should such assistance be decided upon, it must be recollected that it is not to be attempted, in ordinary cases, until the head has reached the floor of the pelvis; in other words, until the head has reached that part of the pelvic cavity where rotation takes place naturally and spontaneously. Sometimes rotation can be secured by the finger alone placed on the side of the forehead. Usually, however, bipolar pressure is necessary; that is, one or two fingers can be placed on the side of the forehead and a lever be inserted over the side of the occiput. Often the best method is to apply the *straight short* forceps, secure rotation, and then complete the delivery by aid of this instrument.

None of these manipulations are to be done rudely or quickly; on the contrary, they should be kept up for a long time. Gentleness, not violent force, is essential to the safe and proper management of these often most difficult and trying cases. The head is rather to be *coaxed*, than compelled, to rotate.

Spontaneous rotation takes place much more easily and quickly in these cases when the bag of waters is not ruptured. Hence, should an occipito-posterior position be recognized during the first stage of labor, care must be taken to preserve the bag as long as possible—certainly until the occiput has come to the front.

It is asserted that the position of the woman on her right or left side (according as the case may be a right or left occipito-posterior position) favors signally spontaneous rotation. Hence the simplest and often best treatment is to preserve the bag of waters, and place the woman on her right or left side, and attempt nothing else until these have proved ineffectual. Constantly, however, the forceps will be found necessary, if not to secure rotation, at least to relieve a woman exhausted by prolonged effort, and a child in great peril from prolonged pressure.

The occiput, in spite of any or all of the assistance just recommended, sometimes goes into the hollow of the sacrum. I believe that in the great majority of such cases, when such posterior rotation takes place, *notwithstanding* all our efforts to prevent it, the case is really a sixth position—an occipito-sacral position; that the head early in the labor assumed an oblique position at the superior strait; that the body, however, did not participate in this movement, but was held tightly by the grasp of the uterine walls, with the back of the child's body looking directly to the spinal column of the mother; that the medical attendant diagnosed (he could not do otherwise) an *oblique* occipito-posterior position of the vertex: he has attempted to secure rotation, and has failed, not because his manipulations were not skilfully rendered, perhaps, but solely for the reason that the walls of the uterus grasped the body of the child so tightly that the head could not even be forced to rotate. I believe that in all cases, where a normal head fails to rotate on a normal perineum, the trouble is a sixth position. The occiput then sometimes, in spite of every effort to prevent it, goes into the hollow of the sacrum, and the result is, if the head be large or the soft parts rigid, often one of the most difficult cases in obstetrical surgery. In these cases of posterior rotation, unless the child be small, the pelvis capacious, the soft parts relaxed, and the *voluntary powers* great, we need not expect the labor to terminate, spontaneously, safely to mother and child. An impacted head for only three or four hours may prove quite sufficient to cause sloughing of the maternal parturient surfaces, with all the subsequent horrors that such sloughing suggests, from puerperal septicæmia down. At the same time, the cerebral centres of the child may undergo dangerous or fatal compression.

My earnest advice, in all difficult cases of this kind, is not to hesitate or vacillate or delay, but promptly to furnish assistance. A pair of *short, straight* forceps should be applied *immediately*, and a firm but prudent attempt be made to *force* (the time for coaxing has passed) a rotation of the occiput to the pubis. In doing this we transgress the rule not to force the child's head to rotate more than a quarter of a circle, for fear of dislocating its cervical vertebræ. But we are justified in this heroic procedure by the fact that the child's chances are greater, delivered even by this highly dangerous method, than if the case were not interfered with, while the mother is saved a most perilous labor. Should this attempt at *forced* rotation fail—and probably it will fail—then the delivery may be secured possibly by traction with the forceps, though the occiput remain in the sacrum. The forceps here must be used with the greatest care and prudence, and even when most skilfully employed may be insufficient to accomplish delivery; or, if delivery be secured by it, the pressure necessary is often so great that the child is stillborn, or its cerebral centres so damaged that it speedily perishes, or, what is worse, survives as a paralytic idiot, or, still worse, attains maturity with a mental and physical organization more or less imperfect, the result directly of the difficulties attending its birth.

Should a *prudent* application of the forceps fail—and it constantly will fail—then the forceps must be abandoned. The forceps in any difficult case of labor must only be used as a conservative instrument. When violence or improper force is resorted to, the forceps ceases to be a conservative instrument, and becomes a highly dangerous one—often as fatal to the child as a pair (which it actually becomes) of crushing craniotomy forceps, and much more dangerous than these to the mother. When we abandon the forceps, however, we do not abandon for one moment our patient. We do not think of "waiting and trusting to Nature;" there can be no rest until labor is completed. The child is practically lost, and every minute of delay lessens the chances of the mother. The next procedure is embryotomy; and this is not to be slowly thought of, and still more slowly performed; but if it must be done, it must be done immediately.

We sometimes hear embryotomy spoken of as a barbarous operation, as an operation never justified, as an operation which in the future will be banished from obstetrical practice. Such opinions can only be entertained by men who have had absolutely no experience in difficult cases of labor, and particularly in the kinds of cases now under consideration. Here embryotomy, instead of being a barbarous operation, becomes a highly conservative and benign one. The child is lost; the forceps have proved powerless to save it. Delay means *certain* disaster, probably death, to the mother. Embryotomy does not kill the child; the impossible labor kills it, and embryotomy saves the mother. Embryotomy, prudently performed, in these cases is not dangerous—is not to be compared to the danger of the injudicious use of the forceps, while it at once places the mother in safety. My earnest advice is, in the case under consideration, to resort immediately, after failing with the forceps, to embryotomy. More than this: I consider the practitioner who fails to give the mother this last chance is *criminal* in his ignorance or his timidity. Never be too timid to save your patient's life. The greater the emergency, the greater the heroism demanded to meet it. The "trust-to-Nature" practice here means *murder*, and the timid and vacillating practitioner is accountable for the tragedy which surely follows such practice. The man who is too pusillanimous to shoulder grave responsibility in the hour of great peril is not fit to practice obstetrics.

A consultation should now be called, since no medical man, no matter what his position or age in the profession may be, would be justified, unless the urgency was very great and a speedy consultation impossible, in performing embryotomy on a living child without one. As soon after consultation as practicable the head should be opened and the case terminated.

But suppose—as is by no means unlikely—the medical man, called in consultation, demurs, suggests delay, trusting "a little longer" to Nature, or says the operation is unjustifiable and unnecessary: what is to be done? I then advise that the dangers be stated to the patient and her friends, a free and candid opinion being given as to the necessity of an immediate operation. If they decide against the operation, instantly abandon the case. If you continue in it, you countenance a management that must have a disastrous termination, and you will have to bear your share of the odium sure to attach to the medical men who mismanage their cases to fatal or unfortunate results.

FIFTH POSITION.—*Left Occipito-posterior Position.*—The treatment of the fifth position, as well as the treatment of the sixth, must be the same as that just recommended for the fourth position, and therefore needs no further discussion.

DEVIATED OR IRREGULAR PRESENTATIONS OF THE VERTEX.

Perfect flexion of the head gives a vertex presentation. Sometimes, however, the head is not perfectly flexed, and then, instead of the cervico-bregmatic circumference, the occipito-frontal, with its 4-inch diameter, becomes involved. We have seen that the occipito-frontal circumference is common in vertex presentations before labor actually begins, since the head reposes at the mouth of the uterus, not perfectly flexed; and we have also seen that one of the earliest changes of labor is to complete the flexion of the head, and bring the vertex fairly to offer. In some rare cases, for reasons not always evident, this desirable flexion fails to take place, and we have what some authors describe as a distinct presentation.

PRESENTATION OF THE ANTERIOR FONTANEL.—Instead, however, of describing a distinct presentation of the anterior fontanel, I think the subject is simplified, and much more readily understood and recollected, by discussing it as a deviation from a vertex presentation. In any of the six positions of vertex presentations complete flexion may not take place, and a so-called presentation of the anterior fontanel is the result. Should the position be a third or a sixth, there would be an arrest of the head at the superior strait, since four inches (the occipito-frontal diameter) cannot pass through four inches, the antero-posterior diameter of the superior strait.

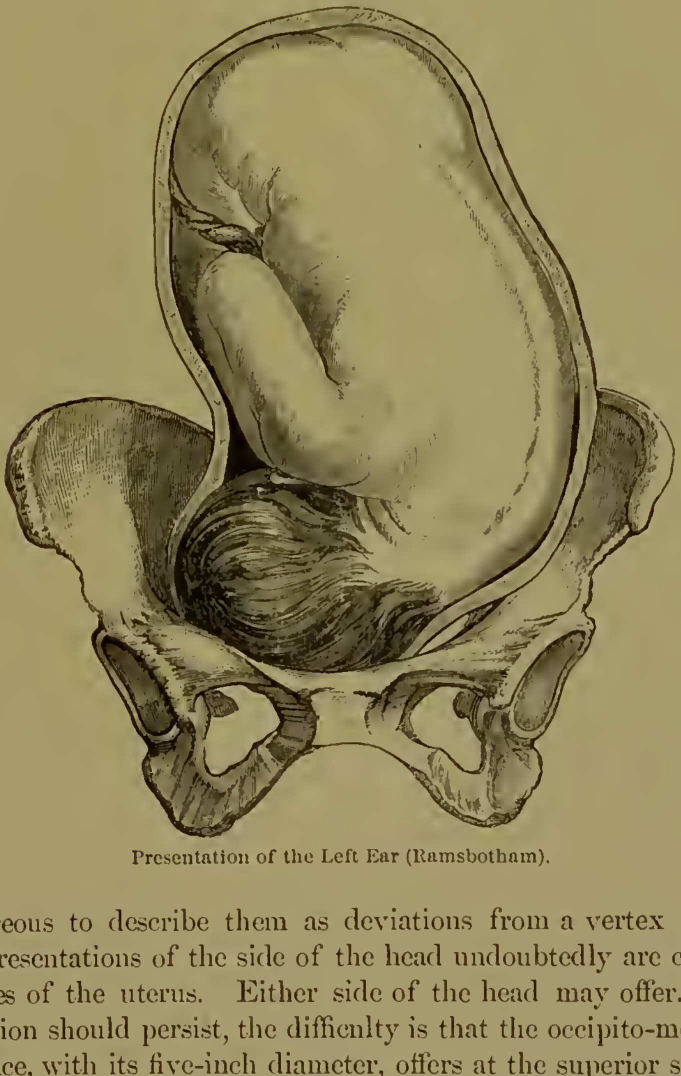
In the oblique positions of anterior fontanel presentations, the occipito-frontal diameter could pass readily through either the oblique (5 inches) or the transverse (5¼ inches) of the superior strait, but would be arrested at the inferior strait by its four-inch diameter.

The indication for treatment, in all cases of the kind now under discussion, evidently is to secure flexion; in other words, to convert a deviated vertex presentation into a complete vertex, and to cause the cervico-bregmatic circumference, with its three and a half inches of diameter, to offer instead of the occipito-frontal circumference, with its longer four inches of diameter.

Flexion is to be secured by the finger or lever, or both. A finger may be placed on the forehead, and may be kept there, and thus, often, gradually, complete flexion may be secured; or, a lever may be slipped over the occiput, and the back of the head be well brought down; or both of these manœuvres may be employed simultaneously. In occipito-posterior positions of anterior fontanel presentations the indications are to secure anterior rotation of the occiput, and, at the same time, cause the head to flex. When the forceps is demanded, it is highly important that the head should, if possible, be completely flexed before tractions are made.

INCLINED PRESENTATIONS OF THE VERTEX.—*Presentations of the Sides of the Head.*—Sometimes, in rare instances, the child offers by the side of its head. An ear or one parietal protuberance is found at the centre of the superior strait instead of the vertex. Such cases have been described as distinct presentations; but, for reasons already given in discussing presentations of the anterior fontanel, I think it more advantageous to describe them as deviations from a vertex presentation. Presentations of the side of the head undoubtedly are caused by obliquities of the uterus. Either side of the head may offer. If the presentation should persist, the difficulty is that the occipito-mental circumference, with its five-inch diameter, offers at the superior strait, and the head is arrested. Luckily, the occiput may slip into the cavity of the pelvis, the head flex, and a fair vertex presentation terminate the labor. Should this favorable spontaneous termination not happen, the head remains arrested and labor becomes impossible.

FIG. 256.



Presentation of the Left Ear (Ramsbotham).

The indication for treatment of labor in a presentation of the side of the head *is not* to "trust to Nature" or to wait for a spontaneous termination. Assistance should be *immediately* given, since all assistance is more easily rendered early in labor, but becomes more difficult and painful as time elapses; while early assistance saves the mother and child from present suffering and future danger. The indications are to restore the vertex. Should the patient be seen early in labor, before the rupture of the bag of waters and before the head has escaped from the mouth of the uterus, and should the attendant be an experienced operator, version by the feet might be a possible proper treatment. I should not hesitate myself to perform it under the above circumstances. Under any circumstances version by the vertex would be indicated, the hand to be introduced, fingers to the sacrum; the head grasped, and pushed up during the absence of a pain; the fingers are now to be slipped over the occiput and the vertex brought down. Should this manœuvre prove impossible—and it is much more difficult than it *sounds*—a *bimanual* version of the vertex may be attempted. One or two fingers may be placed on the side of the neck or about the mastoid process, while the other hand presses on the head from the outside and through the abdominal walls. A simultaneous pressure by both hands will sometimes cause the head instantly to change its position, and a complete vertex presentation is at once secured. Finally, the lever, inserted over the head, sometimes quickly and easily removes the difficulty.

Should all of these attempts fail, the forceps may be resorted to. The blades should be applied to the sides of the pelvis, and the head should be grasped as accident determines. Careful traction should be made. Of course the five inches of diameter cannot pass, but the traction seems at times to loosen and dislodge the occiput, which finally descends, flexes in the grasp of the instrument, and the case is terminated successfully.

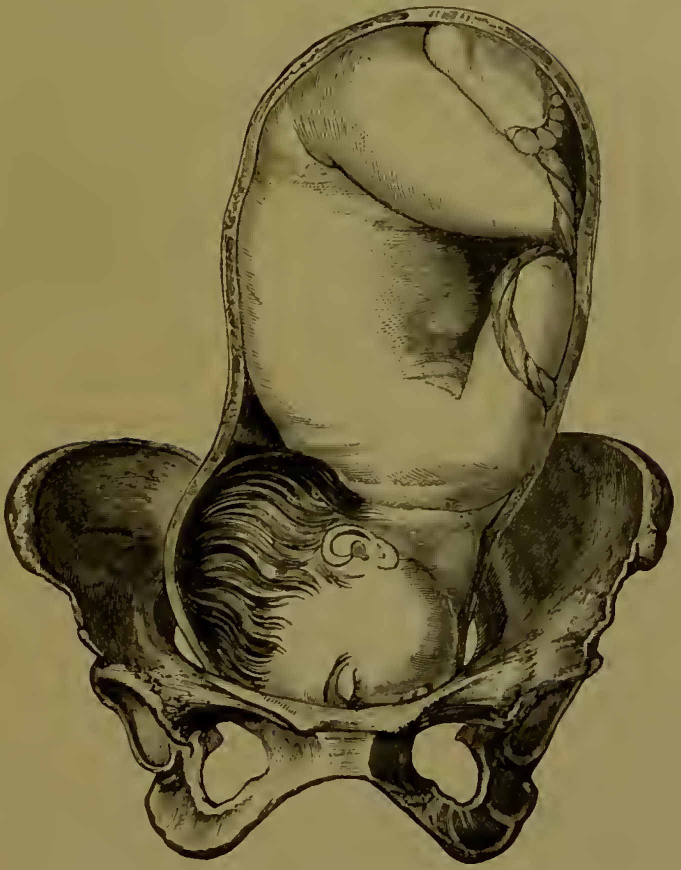
Should the forceps fail, nothing is left but craniotomy, and the sooner this is resorted to the better for the mother.

FACE PRESENTATIONS.

Complete flexion of the head causes the vertex to present; complete extension of the head causes a face presentation. Face presentations are not common; they occur once in about 250 cases of labor.

The ordinary cause of face presentations is obliquity of the uterus: the vertex strikes on the edge of the strait and is arrested, and the face descends. Cases are reported where, in post-mortem examinations made on women dying at full term, the dead fœtus has been found in the womb offering by its face. I believe that in all such instances the child has been convulsed before or at the moment of its dissolution, and the condition of opisthotonos has placed the head so as to cause the face to present. It seems highly probable that a primitive face presentation in a living child is the result of similar causes; that is, that such a prim-

Fig. 257.



Transverse Position of the Face at the Superior Strait.

itive face presentation is caused by some attack of convulsions in the fœtus occurring shortly before labor.

Mechanism of Labor in Face Presentations.

Not to confuse the reader, we will consider in our description of the mechanism of labor in face presentations the same number of positions we studied in vertex presentations; that is, six positions. In three of these positions the chin is turned to the anterior part of the pelvis, and we term them mento-anterior positions. In three the chin is turned to the posterior part of the pelvis, and we term them mento-posterior positions.

First Position of Face.—*Left Mento-anterior Position.*—The chin looks to any part of the left anterior inclined plane.

Second Position.—*Right Mento-anterior Position.*—The chin looking to any part of the right anterior inclined plane.

Third Position.—*The Mento-pubic Position.*—The chin at the symphysis.

FOURTH POSITION.—*Right Mento-posterior Position.*—The chin in relation with the right posterior inclined plane.

FIFTH POSITION.—*Left Mento-posterior Position.*—The chin in relation with the left posterior inclined plane.

SIXTH POSITION.—*The Mento-sacral Position.*—The chin directly to the sacrum.

The most common position of the face is the second, the chin to the right anterior inclined plane. This we would naturally infer when we bear in mind that a left occipito-anterior position of the vertex—the common position in vertex presentations—would be converted by uterine obliquity into a face presentation, with the chin looking to the right side of the pelvis. We may study, therefore, the mechanism of this second position of the face as the typical mechanism.

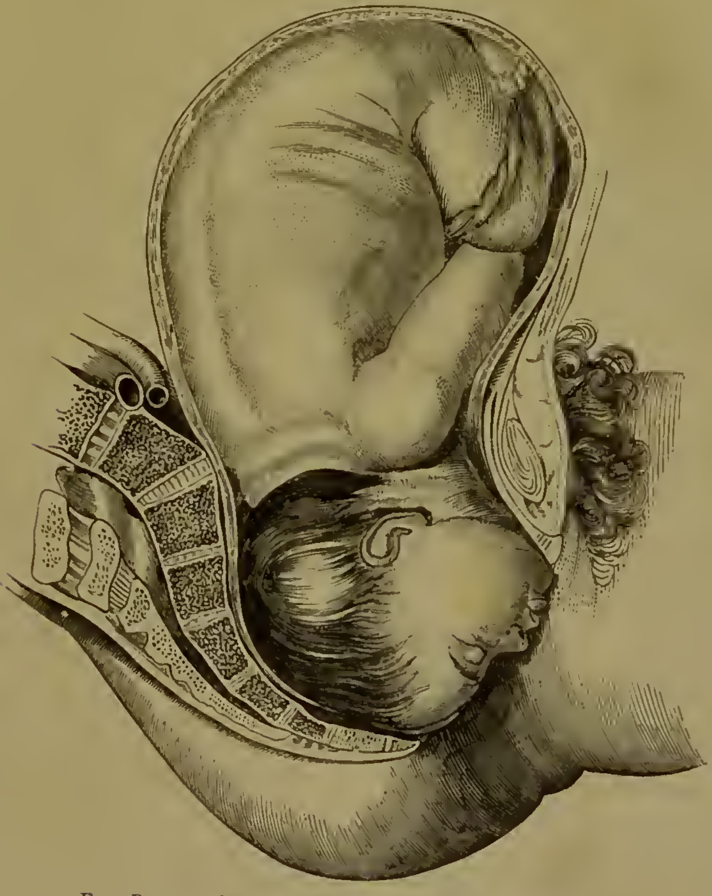
Before the rupture of the membrane, the head, as a rule, is not completely extended, and the forehead offers rather than the face—a condition analogous to that which we have studied in a vertex presentation before the escape of the liquor amnii. When the bag of waters ruptures, owing to the circumstance that the presenting part does not fit so completely the os uteri as it does when the vertex offers, the whole of the liquor amnii usually escapes, and the walls of the uterus grasp the fœtal body.

The first effect of uterine contraction, after the rupture of the bag, is to complete the extension of the head (adaptation). In a vertex presentation, adaptation means flexion. The extension of the head causes the face fairly to offer at the superior strait, and we have two circumferences to study—viz. the fronto-mental circumference, which is the apparent circumference involved, and the trachelo-bregmatic circumference, which is actually the real and important circumference after the face descends into the cavity.

The fronto-mental circumference has its largest diameter, the fronto-mental diameter (3 inches), the trachelo-bregmatic diameter being $3\frac{1}{2}$ inches. We have, therefore, at the superior strait, in a right mento-anterior position, these two diameters, successively, in relation with the oblique or transverse diameters of the brim (5 and $5\frac{1}{4}$ inches): the biparietal diameter ($3\frac{1}{2}$ inches), being in relation with the oblique of the opposite side, or the antero-posterior (5 and 4 inches), the occipito-frontal diameter being more or less in the axis of the superior strait. As there is ample room at the brim, the face engages and descends only as far as it can descend; that is, only as far as the length of the neck will permit it to descend.

In an occipito-anterior position of the vertex, we have seen that the occiput descends from the superior strait to the floor of the pelvis without changing its position. But in a face presentation this can only take place at the symphysis pubis, since a complete descent of the face in any other position implies either that the length of the anterior part of the child's neck is sufficient to reach from the brim to the outlet, a distance of $3\frac{1}{2}$ inches at the sides of the cavity, or that there should be a simultaneous engagement of the extended head and the upper part of the trunk—an impossibility in a fœtus of normal size. The face now descends, the chin on the right anterior inclined plane, only as far as the length of the neck will permit, when it is arrested and can advance no farther. Now, usually (often after great delay), the chin, resting on the obliquely inclined surface of the anterior inclined plane, receives sufficient force of resistance to cause it to rotate to the symphysis pubis. At the symphysis pubis, as we have just stated, the depth of the pelvic cavity is one and a half inches; therefore at the symphysis pubis, and here alone, is the child's neck long enough to measure from the superior to the inferior strait. The chin now is pushed under the arch of the pubis, and the anterior part of the neck is pressed closely against the symphysis. Presently the chin can advance no

FIG. 258.



Face Presentation, Chin anterior, at the Inferior Strait.

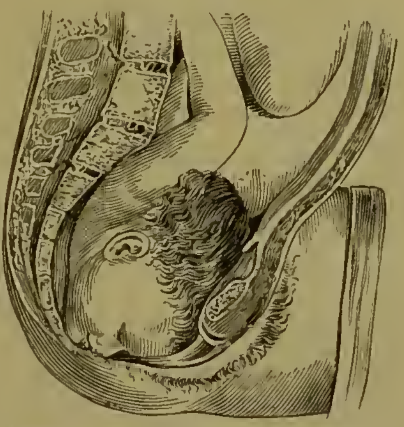
farther, and becomes locked beneath the arch, the anterior part of the neck resting on the subpubic ligament. Here we have a situation exactly analogous to that which we studied in vertex presentations, when the perfectly flexed head rotated, and the occiput went under the arch, and the back of the neck pressed strongly against the symphysis pubis, the nape of the neck resting on the subpubic ligament, and the occiput locked beneath the arch and unable to advance. In a face presentation, after rotation of the chin to the symphysis, we find a perfectly extended head, the chin under the arch, the pretracheal region resting on the subpubic ligament, and the chin locked and unable to advance.

Now, still following the analogy we have witnessed in vertex presentations, the occiput, which has been, in consequence of the extension of the head, pressed firmly against the back of the child, under the influence of the expelling forces, the chin being locked, leaves the back, sweeps through the hollow of the sacrum and through the hollow of the distended soft parts, and finally the head is born by a process of flexion, the anterior part of the neck resting, as a point of support, on the subpubic ligament, and the occiput describing round it the arc of a circle having for its radius the trachelo-bregmatic diameter (3½ inches), while the occipito-frontal diameter is, more or less, in the axis of the outlet. In a face presentation, after the expulsion of the head, the body is delivered by a mechanism similar to that in vertex presentations.

The left mento-anterior position has a mechanism identical with that just described for the right mento-anterior. The mento-pubic position, as an occipito-pubic of the vertex, would tend to be spontaneously converted at the superior strait into an oblique position. Should this change not occur, the mento-pubic ought to prove, provided the head be perfectly extended, the easiest of the mento-anterior positions, since the chin enters the superior strait, where the length of the neck can reach from the brim to the outlet, and rotation—the great difficulty, as we shall presently see, in all oblique face presentations—is not necessary. In a mento-pubic position the chin simply sinks down along the inner face of the symphysis pubis, becomes locked under the arch, and labor terminates, as in the other mento-anterior positions, by flexion of the head.

Mento-posterior Positions.—The mechanism of labor in mento-posterior positions can be stated in few words. Let us take the fifth position of the face as the typical position, the chin to the left posterior inclined plane. We have, at the superior strait, the same 3 and 3½ inches of diameter that we have already studied in the mento-anterior positions, and therefore there is nothing to prevent the speedy descent of the face. The face descends as far as the length of the child's neck will allow, and no farther. In mento-anterior positions the chin, resting on the hard and slightly oblique surface of the anterior inclined plane, secures generally, in time, sufficient force of resistance to cause the diagonal movement which places it finally beneath the arch; but in a mento-posterior position the chin is pushed down, looking to one of the sacro-iliac symphyses, where the excavation is deep, and where it can meet no resisting surface to impress upon it a movement of rotation. Hence, in mento-posterior positions, the chin descends quickly and easily as far as the length of the neck will permit, when it is arrested, and labor becomes impossible. In rare instances, after a long struggle, some point of resistance might be afforded, and then an anterior rotation of the chin and a spontaneous termination might be possible. But such anterior rotation is not to be expected, and we are justified in declaring that *all mento-posterior positions* are to be considered as *practically impossible* positions, and are *never to be trusted to Nature*, but are to be *immediately assisted*.

Fig. 259.



Mento-posterior Position, chin rotated to sacrum.

Face presentations are not only tedious and difficult (even those where the position is favorable), and sometimes, as we have just seen in mento-posterior positions, impossible, but they are often dangerous or fatal to the child. The danger to the child is due to compression, all through labor, of the blood-vessels of the anterior part of the neck, producing a cerebral plethora and a disposition to convulsions. This danger to the child should never be forgotten, and labor may demand speedy termination often solely on its account. It must also be borne in mind that the face of the fœtus becomes the seat of the caput succedaneum, and hence, when labor is tedious, the child at birth presents often an appearance that greatly shocks and frightens the parents and friends. Its face is almost or quite black, its cheeks are swollen, its lips are turned in, and the nose scarcely visible, while the face, in addition, is often wounded and scratched by the examining finger of the impatient and anxious medical attendant. It is well to state beforehand to the friends the probability of such terrifying appearances, and also to assure them that a few days will remove all traces of these peculiarities. A child born by a face presentation exhibits a marked tendency in its head to fall back whenever all support is withdrawn. This phenomenon is due to the prolonged pressure upon and stretching of the sterno-cleido-mastoid muscles, and will also spontaneously disappear in two or three days.

DIAGNOSIS OF FACE PRESENTATIONS.

(*Cazeaux.*)

The diagnosis of face presentations is made out more or less easily according to the period of labor at which the examination is made. Before the membranes are ruptured, the head in general is high and difficult of access, so that it is almost impossible to reach the presenting portion, provided the membranes are the least tense. Again, the reversion of the head not being yet completed, the forehead is the lowest part, and the one the finger encounters in performing the touch; whence by feeling a hard, rounded body furrowed by a membranous interval (the coronal suture), we might very readily mistake it for a vertex presentation. But if the flaccid and folded membranes can be depressed without difficulty, or, still better, if they have been recently ruptured, the diagnosis becomes easier. Then we find toward one side of the pelvis a rounded, solid surface, the forehead, traversed by a suture leading to a transverse depression; next a triangular elevation whose base, looking in an opposite direction from the forehead, exhibits two openings, the nares, and beyond this a transverse fissure bounded by the superior and inferior maxillary arches. Sometimes the finger when introduced into the mouth of the child has been clearly sensible of an effort at suction. On the sides of the median protuberance, two little soft tumors (the eyes) are felt, surrounded by an osseous circle; and, lastly, when the head is low down, an ear may be detected behind the pubis.

When the presentation is once determined, the position is easily made out, for the opening of the nostrils must evidently look toward that part of the pelvis which corresponds with the chin. When a long time has elapsed after the rupture of the membranes new causes of difficulty are met with. Thus, the face, which now corresponds to the open space in the pelvis, becomes the seat of a considerable tumefaction, due to the same cause which produces the tumor of the scalp in vertex presentations. The cheeks, being greatly swollen, and at the same time compressed on the sides, project and lie close to each other in front, thus leaving a deep fissure between them, in the bottom of which the distinctive characters of the face are entirely concealed; this fissure might very readily be mistaken for the one between the nates, which are then confounded with the tumefied cheeks. Further, the lips are also swelled, wrinkled, and everted in such a manner as to offer a rounded orifice, instead of the usual transverse fissure; and this orifice has been mistaken in some instances for the anus; hence in such cases a careful examination seems to be necessary to avoid an error which has not unfrequently been committed.

THE TREATMENT OF FACE PRESENTATIONS.

It is remarkable that there is the greatest diversity of opinion among writers and teachers on this subject; and it is lamentable that, in consequence doubtless of this diversity of opinion, as well as also from a want of clear and definite conceptions of the physiology and treatment of these presentations, medical men are often totally ignorant of their proper management. It has been my lot to meet with several instances where respectable and well-educated men have conducted cases of face presentations so ignorantly and improperly that the lives of both mothers and children were lost.

Some authorities hold that face presentations are cases of unnatural labor and usually demand prompt interference, while others assert that they are cases of natural and easy labor and require no assistance.

A recent writer on Obstetrics, in discussing face presentations, after describing a mechanism, says: "All of which takes place with no greater difficulty than in an ordinary cranial position;" farther on he remarks: "We have attempted throughout in the description to indicate the strong analogy which exists between them and the ordinary positions of the cranium."

In suggesting a new and most important principle in the management of face presentations—a principle, too, based on what I consider the *only* correct theory of their mechanism—it becomes necessary to test these views, since my experience compels me to differ from them entirely. I hold that a face presentation is much more difficult and much more dangerous than "an ordinary cranial position," and that there is no more analogy between a face and a vertex presentation, either in mechanism or in any other respect, than there is between a trunk presentation and "an ordinary cranial position."

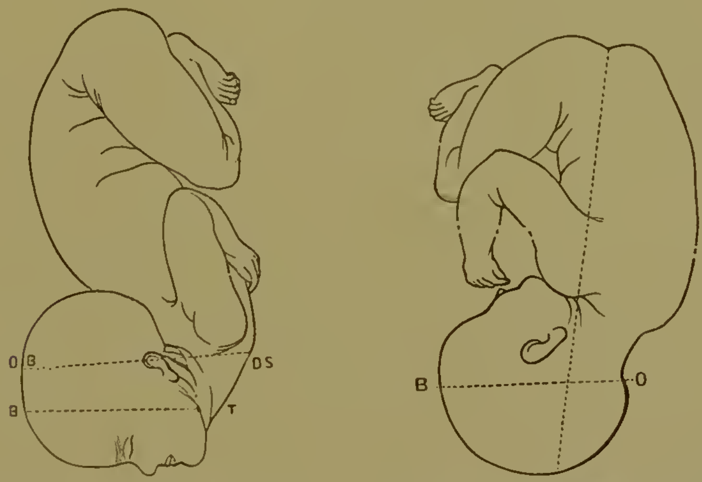
Can this assertion be sustained?

In a vertex presentation—I mean by a vertex presentation where the head offers completely flexed—we find the most favorable cranial diameters presenting: viz. the diameters of the occipito-bregmatic (cervico-bregmatic) circumference, three and a half inches in each direction; coinciding with these most favorable diameters there is also, in vertex presentations terminating by anterior rotation of the occiput, the perfect and complete co-operation of all the parturient forces to accomplish easily and safely the expulsion. The advancing vertex receives the force of parturient actions, through the spinal column, *in almost a direct line;* without difficulty it reaches the floor of the pelvis; here it meets the force of resistance, which in due time secures that rotation to the arch of the pubis essential in most cases to the spontaneous termination of labor.

Now, what are the conditions in a face presentation? Take, as an example, a case where the chin offers toward the right acetabulum (the right mento-anterior position). The cranial diameters involved in a presentation of this kind are extremely favorable; indeed, though different, they possess precisely the measurements of the diameters concerned in a vertex presentation; they are the diameters of the trachelo-bregmatic circumference, measured from the anterior edge of the foramen magnum to the posterior angle of the anterior fontanel, three and a half inches in each direction. How is it, then, if the cranial diameters involved in a face presentation are so favorable, I can maintain the assertion just made, that there is no analogy whatever between a face and a vertex presentation? In the first place, there is not the slightest resemblance in the mode of action of the propelling forces. In vertex presentations, as I have remarked, the advancing occiput receives in a direct line, through the spinal column, the parturient forces. In a face presentation, the head being completely extended, the force of the parturient actions is communicated to the advancing face, not in a direct line, but through the cervical vertebræ *bent at a right angle;* hence the face, instead of being propelled promptly by well-applied and well-directed force, is rather made to advance slowly and uncertainly by *being dragged after the neck*—in other words, made to advance slowly and uncertainly by the action of parturient forces applied, not in the best possible manner, as in vertex presentations, but in the worst and most inefficient manner possible, involving an enormous loss of the expelling force, with the necessary result of greater delay and the grave consequences which this greater delay always implies. Certainly here we recognize no analogy or resemblance between the face and vertex presentations.

Again, in a vertex presentation the occiput, receiving the entire force of the parturient expelling effort, easily and speedily reaches the floor of the pelvis, where it meets usually the force of resistance, and anterior rotation is secured. In a face presentation, in spite of the most favorable cranial diameters offering, the very reverse is witnessed. The face, engaging, descends into the cavity of the pelvis; but how far does it descend? The writer whom I have quoted says it descends "until the face reaches the floor of the pelvis." Is this statement correct for a case at term and where normal diameters are involved? In the position I have taken as an example—viz. where the chin offers toward the right acetabulum—the face descends, the chin passing down the right ischiatic plane, only, however, as far as the length of the child's neck will permit—that is, only for about an inch and a half; but the depth of the pelvic cavity at this spot—viz. the right acetabulum—is three and a half inches, and the chin *cannot* descend to the floor of the pelvis, because to do so will require either that the child's neck shall become elongated to an extent impossible, or that there shall be a simultaneous engagement of the head and of the upper part of the trunk in the pelvic cavity. But the occipito-bregmatic diameter is three and a half inches, and the dorso-sternal diameter is three inches, together six and a half inches, and six and a half inches cannot engage in any part of the superior strait. Hence the chin in face presentations cannot reach the floor of the pelvis at the lateral or posterior part of the pelvic cavity, but can only descend as far as the length of the child's neck (an inch and a half) will permit. Here, too, we again fail to detect the slightest analogy between face and vertex presentations.

Fig. 260.



O–B, occipito-bregmatic diameter, 3½ in.
T–B, trachelo-bregmatic diameter, 3½ in.

DS, dorso-sternal diameter, 3 in.
OB, occipito-bregmatic diam., 3½ in.
6½ in.

The face, having descended into the pelvis as far as the length of the neck permits, necessarily can advance no farther, and the head is arrested, and labor can only terminate spontaneously by the chin coming to that part of the pelvic cavity where the child's neck *is* long enough to reach from the superior to the inferior strait; that is, to the symphysis pubis, at which point the depth of the pelvic cavity is but an inch and a half. In the majority of cases of face presentations this essential anterior rotation of the chin ultimately occurs; if, however, rotation should not take place, labor becomes impossible, save in cases so rare and exceptional that they are not to be expected.

All writers on the subject agree that face presentations, even when terminating spontaneously by anterior rotation of the chin, usually are extremely tedious. Why are they tedious? My answer to this question and the treatment suggested by the answer are what I claim as new and original points in these interesting presentations. Perhaps I can elucidate the subject best by an illustrative case:

Many years ago I was asked to see a woman who had been in difficult labor for twenty-four hours. The patient was a powerful woman, of uncommon strength and muscular development, possessing also a capacious pelvis. This labor was her fourth; her former confinements, in consequence of the conditions to which I have referred, had been rapid and easy, terminating in a few hours with little pain and no difficulty. Now, however, she had been in active labor for twenty-four hours, and her medical attendant was exceedingly apprehensive as to the result. On examination I found the child offering by its face, the chin directed to the left ischiatic plane. It was a fair, typical case of face presentation. As the woman had been in labor for twenty-four hours, I determined to apply the forceps immediately, but after several unsuccessful efforts to secure parallelism between the blades, so as to accomplish the locking of the branches safely, I abandoned the attempt. The woman's condition, notwithstanding her twenty-four hours of active labor, was good, and all the circumstances of the case appeared most favorable—viz. chin to plane of ischium, capacious pelvis, child of normal size, and the parturient forces unusually powerful. We decided, therefore, to wait and give *Nature* a longer trial. Twelve hours later I found the face precisely where I had left it in the morning; the chin had descended perhaps half an inch, more or less, along the plane of the ischium, but not a line had it advanced toward the pubis, and this in spite of the most tremendous uterine and voluntary efforts, frequently repeated, that I have ever witnessed. Evidently, no time was to be lost. The woman was rapidly becoming maniacal as a result of her immense but absolutely futile struggles. Again I applied the forceps; again met the same difficulty I had experienced in the morning; again abandoned the attempt. At this moment of excitement and trial, of anxiety and disappointment, with the cries and groans of the wretched and hopeless woman crowding my ears, I endeavored to solve the problem, Why does the chin not come to the symphysis pubis and the labor terminate spontaneously? The pelvis is of ample size; the face fairly presenting and not too large; the forces are immense; and yet Nature has failed, after thirty-six hours of violent labor, to accomplish delivery.

Suddenly and without warning the illumination came to me; the solution of the problem flashed into my mind, and with the most perfect faith I followed the leading which the new light revealed to me. The revelation was this: The child's chin does not come to the front because it can descend only an inch and a half into the pelvic cavity; if it could but reach the floor of the pelvis, then it would at once have impressed upon it a powerful force of resistance in consequence of the immense parturient efforts, and anterior rotation would be speedily accomplished. But it cannot reach the pelvic floor to secure this essential *point d'appui* in order to accomplish rotation. Why not, then, apply a force of resistance, and thus artificially furnish the essential *point d'appui?*

In far less time than I have occupied in writing these few lines, I proceeded to act on my new teachings. I applied a blade of the forceps on the posterior cheek. *I did not attempt to force a rotation of the chin;* I merely held the blade firmly against the side of the face in order to ascertain whether my reasoning was correct. To my utter amazement, this face, which had been so immovable for thirty-six hours, not slowly, not after the lapse of some minutes, but almost instantly responded, the chin swept across the plane of the ischium, slipped under the arch of the pubis, and in *less than five minutes* the child was born.

This, then, is the new point I make: face presentations, as we have seen, are almost always tedious, sometimes painfully so, sometimes fatally so, because the face cannot, save in exceptional cases, reach the floor of the pelvis, where alone it can receive that complete force of resistance which in vertex presentations secures ready anterior rotation. But, it may be urged, face presentations do terminate, usually, spontaneously by anterior rotation of the chin. This is true. The chin, after descending an inch and a half, *may receive* a feeble, imperfect, and badly-applied force of resistance from the slightly-inclined side of the pelvic cavity on which it rests; which imperfect force, after many hours perhaps of delay and suffering, *may* bring it slowly, strugglingly, uncertainly to the symphysis pubis. But these hours of delay are not devoid of grave peril both to the mother and the child. During the whole of the second stage of labor in a face presentation the anterior part of the child's neck is exposed to more or less pressure, and if this pressure be prolonged, cerebral congestion, or even cerebral effusion, may be the result, and convulsions or death the ultimate consequence. Statistics show that in face presentations, even when terminating spontaneously by anterior rotation of the chin, one child in ten perishes, and when anterior rotation does not take place scarcely any survive.

If the views which I have given be correct, it is evident that there is no resemblance of any kind between face and vertex presentations, and it is also evident that they demand totally different treatments.

Vertex presentations where the occiput comes to the arch of the pubis are the most favorable of all presentations, as, fortunately, they are by far the most common, and, as a rule, neither require nor admit of any treatment. Face presentations, on the contrary, even when the chin is originally directed toward the sides or the anterior parts of the pelvis (mento-anterior positions)—in other words, even in those cases considered by many writers as cases of natural labor—never, as a rule, should be trusted to Nature, but should always be assisted. Happily, when the principles of mechanism on which it is based are understood, the assistance needed is as simple as it is easily applied; but when applied, as in the very interesting case I have related, this very simple procedure will cause a labor to terminate many hours sooner than it otherwise would have done, or will render a labor, which might have proved impossible without it, speedy and easy.

The assistance which I advise in all cases of face presentations of mento-anterior positions is, as soon as the mouth of the uterus is dilated and the face has fairly engaged, to apply the hand, the lever, or the blade of the forceps to the posterior cheek; in other words, to bring artificially a force of resistance to bear on the face, inasmuch as the face, for the reason I have already given, cannot secure this force of resistance from the tissues of the pelvic floor, as the vertex does in vertex presentations, and therefore the chin does not rotate, or does so slowly and uncertainly, to that part of the pelvic cavity where a spontaneous termination of labor is alone possible. If the medical attendant apply this force of resistance at the time and in the manner I have directed, rapid rotation will be secured and the labor will terminate speedily and safely. If this artificial force of resistance be not applied, then Nature may terminate the case spontaneously, but often not until many hours of useless suffering on the part of the mother, and many hours of perhaps dangerous pressure on the cervical vessels of the child have been passed.

In summing up, then, the whole treatment of face presentations, I will say that, for the reasons just given, they are never to be trusted to Nature. In mento-anterior positions the treatment I have described should be resorted to. If, however, the chin be turned to the posterior part of the pelvis (mento-posterior position), we have one of the gravest cases in obstetric surgery to deal with. Anterior rotation of the chin under these circumstances is possible, but so exceedingly improbable that we have no right to expect it, and we should, as soon as the difficulty is recognized, treat the case as one of impossible labor. If seen in time—that is, if seen *before* the presenting face has passed the mouth of the uterus—I am convinced that the safest and best treatment is to resort promptly to version by the vertex or version by the feet. But either of these methods of procedure must be restricted by the conditions I have laid down; that is, the presenting face must not have passed the mouth of the uterus; should it have done so, version either by the vertex or by the feet involves such great risks of laceration that I consider it entirely unjustifiable; and I can never endorse a treatment recently proposed which consists in placing the woman under complete anæsthesia, and then forcibly flexing the head, converting the impossible mento-posterior position of the face into the natural occipito-anterior position of the vertex. Twice have I known forced version, performed under *complete anæsthesia*, cause speedy death in consequence of laceration of the uterus. Should, therefore, the presenting face have passed the mouth of the uterus, version of any kind cannot safely be attempted. An endeavor may now be made to *force a rotation* of the chin to the symphysis pubis, either by the forceps, the lever, or by placing the finger in the mouth. *Under no circumstances* should the forceps be used to try to deliver the head with the *chin to the sacrum*. Such attempts must prove fatal to the child, expose the mother to frightful risks, and, moreover, will be found unavailing.

Should, then, in any case of face presentation where the chin is posterior, version by the vertex or version by the feet be not permissible, should all attempts to secure forced anterior rotation of the chin by any of the expedients I have mentioned have proved unsuccessful, then there is but one *safe* expedient left, and that is to perform craniotomy. And this, in such cases, *conservative operation* should not be deferred until the mother is so exhausted by her prolonged efforts that she has lost most of her chances of surviving, or so damaged by ignorant and rude attempts to deliver the child along the sacrum (I have known several such cases) that any proceeding is almost hopeless; but a consultation should be called, if one is not already in charge, and, should embryotomy be determined on, the operation should be done at once. The child's viability is destroyed; it is, though alive, practically dead, and all our efforts should be directed to secure for the suffering woman a delivery as speedy and safe as may be.

DEVIATED OR IRREGULAR FACE PRESENTATIONS.

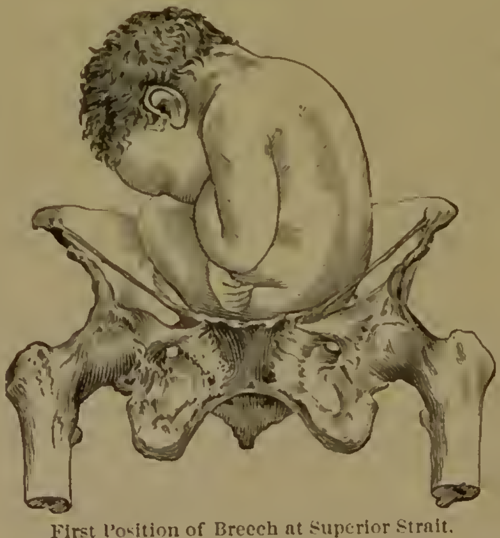
Perfect flexion of the head gives a vertex presentation; partial flexion of the head gives a deviated vertex presentation or a presentation of the anterior fontanel. Perfect extension of the head gives a face presentation; partial extension of the head gives a deviated or irregular face presentation; in other words, partial extension of the head gives a brow presentation. In brow presentations we have the parieto-mental or the occipito-mental circumferences offering at the superior strait (4½ and 5 inches); the head is arrested and labor becomes impossible. Brow presentations, therefore, as such, are impossible cases of labor; they are never to be trusted to Nature, and are always immediately to be assisted.

The indications for treatment depend absolutely on the position. If the occiput be in front, the indication is to flex the head and convert an impossible brow into a most easy occipito-anterior position of the vertex (to convert it into a face presentation would be to convert an impossible brow into an impossible mento-posterior position of face). Should the occiput be behind, the indication is to extend the head, and convert an impossible brow into a face presentation of the most favorable position (to convert it into a vertex would be to convert it into a difficult, perhaps into an impossible, labor); that is, into a mento-anterior position. This flexion or extension of the head is often (in consequence of the condition of unstable equilibrium in which the head is placed) very easily accomplished, and a case of brow presentation, where the head has remained for hours immovable, as soon as restored so as to offer one of the poles of the occipito-mental diameter will terminate with the greatest rapidity. The head can be flexed or extended either by the whole hand—version by the vertex—or by a sort of bipolar version of the vertex, already described in speaking of the treatment of presentation of the side of the head. Sometimes the lever will instantly restore the head to a desirable presentation. Under no circumstances should the forceps be applied until after the head has been made to assume a proper presentation. To attempt to drag down a head with the brow in the lowest part of the blade would be criminal malpractice.

PRESENTATIONS OF THE PELVIC POLE OF THE FŒTAL ELLIPSE—BREECH PRESENTATIONS.

In studying the causes of presentation and position we saw that a normal fœtus in a normal uterus, at the conclusion of a normal gestation—that is, a gestation during which there had been no accidental circumstance happening to mother or child sufficient to cause the child to change its attitude in the cavity of the uterus about the sixth month of gestation—would invariably present at labor by its vertex. Occa-

FIG. 261.



First Position of Breech at Superior Strait.

sionally, however, for reasons already given, the fœtus presents by its pelvic or coccygeal extremity, and this extremity of the fœtal ellipse may offer in several ways. Thus, the breech may offer in its totality —that is, with the thighs flexed on the abdomen and the legs on the thighs; or the lower extremities may offer first, either by the feet or knees; or one limb may be extended along the abdomen, while the other offers partially or completely unfolded.

Instead of considering these several presentations of the elements of a breech presentation as distinct presentations, I shall consider them all simply as breech presentations, since the modifications to which I have alluded do not in any way affect the mechanism involved, or the treatment necessary.

Statistics show that one child out of three is lost when presenting by its breech; they also show that breech presentations occur perhaps once in fifty labors. It is evident, then, that one of the chief causes of mortality to the child during labor is this comparatively common presentation, and that a correct knowledge of its mechanism and treatment is more important to the practitioner than almost any other subject in Obstetrics, save perhaps that of hemorrhage.[1]

DIAGNOSIS OF BREECH PRESENTATIONS.

(*Cazeaux.*)

Even before the commencement of the labor, a breech presentation may be almost positively diagnosticated by the following signs—namely: in thin women, in whom the abdomen, from being previously distended by numerous pregnancies, retains a certain degree of softness and flaccidity (and the womb containing only a moderate quantity of liquid), we may more or less readily detect the head occupying the upper part of the uterus and inclined toward one or the other side. Often no part, however, can be made out by the internal exploration, since the hard rounded tumor felt in the vertex presentations is absent. Sometimes a little tumor (the foot or a knee) can be detected and balloted; and, further, the heart's movements are revealed by auscultation at an elevated point of the abdomen, on a level with, or possibly above, the umbilicus.

To the foregoing signs may be added the following as distinguishable during labor: The bag of waters is very large, and projects considerably into the upper part of the vagina, sometimes assuming the form of an elongated tumor, which may descend even to within a short distance of the vulva.

When the membranes are ruptured a very considerable quantity of water escapes, for the presenting part fills up the neck but very imperfectly, and hence all the amniotic liquid flows out; and if the rupture should occur during a strong pain, it would probably be accompanied by a loud report.

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[1] Dr. J. D. Nourse, *Ohio Medical Record*, reports a woman who had twelve confinements with twelve breech presentations. Her last was twins, one of which had a vertex presentation.

A momentary suspension or a diminution of the pains often results from a too copious or a too rapid discharge of the waters; and, further, a flow of meconium most generally takes place soon after the membranes give way.

But the only characteristic signs are those furnished by the touch, and they will vary with the presenting part.

When the breech alone presents, the finger first encounters a soft rounded tumor, upon some portion of whose anterior surface a hard, resistant part, formed by the great trochanter of the thigh-bone, is detected. Thus far, it might be mistaken for a vertex presentation, but if the finger be next carried upward and backward so as to reach, as it were, the sagittal suture, it will penetrate into the fissure between the nates, at the bottom of which the most important diagnostic signs are discovered; for the point of the coccyx is felt toward one side, surmounted by an irregular osseous surface constituted by the posterior face of the sacrum; then the anus, a small, rounded, and wrinkled orifice, into which the finger cannot be introduced without resorting to considerable force; lastly, the external genital organs can be easily distinguished, and thereby the sex of the child may be announced in advance.

The prominence of the coccyx is not only a certain sign of the presentation, but it may also serve to determine the position, because its point is always directed toward the side not corresponding with the child's back.

Where the two feet present together in the vagina, it is impossible to confound them with any other part, and the direction of the heels then clearly indicates the child's position. But when a single foot only is detected, and that very high up, it might be mistaken for a hand. However, a little attention will serve to distinguish them: thus, the toes are arranged in the same line, are shorter, and less movable, while the fingers are longer and the thumb separated from the others; the internal border of the foot is much thicker than the external, but the two margins of the hand are very nearly of the same thickness; again, the foot articulates with the leg at a right angle, while the hand continues out the line of the arm.

The diagnosis is very difficult when the feet present along with the nates and they alone are accessible. Sometimes even only one foot can be felt, which renders the case still more obscure; then we have first to ascertain which is the foot touched, though for that purpose it is only necessary to pay attention to the relation existing between its internal border and the heel. For instance, let us suppose that the latter is turned toward the symphysis pubis and its internal border to the right side of the mother; this is evidently the right foot: if, on the contrary, the heel be directed toward the sacro-vertebral angle and the internal border to the right, this would be the left foot, etc.; now, the right foot being once distinguished from the left, it only remains to determine toward what part of the superior strait the points of the toes are directed (bearing in mind that we always suppose the inferior extremities to be flexed on the abdomen and the feet crossed and turned inward). In this position of the child, if the toes of the right foot are turned toward any point of the anterior half of the pelvis, the back will be directed to some part of the left lateral half; but if the toes on the left foot point toward the anterior half of the pelvis, the child's back will look to some point on the right lateral half, and *vice versâ.*

The knees very rarely present first; besides, they have such well-marked characteristics in their form, their roundness, their hardness, the size of the limbs attached, and the fold of the ham which surmounts them—a fold presenting a transverse concavity instead of the convexity exhibited at the elbow and instep—that we consider it useless to dilate further upon the diagnosis.

Mechanism.—For the reasons that I have already given in discussing vertex presentations, we may take, in considering the mechanism of breech presentations, at the superior strait, six points of departure—viz. the four inclined planes, the symphysis pubis, and the promontory of the sacrum; in other words, we classify all breech presentations under six positions; three of these we designate as *sacro-anterior* positions, and three as *sacro-posterior* positions. I shall call that position the *first* where the sacrum of the child is in relation with the *left anterior* inclined plane; hence the first position of the breech is the *left sacro-anterior* position. This position is by far the most common, and the cause is evident. In consequence of the presence of the sigmoid flexure of the colon on the left side the child has more room and greater latitude of movement in this first position than in any other; hence the causes which regulate the position of the fœtus in utero—and which you now all so well understand—determine the preponderating frequency of this position. If this reasoning be correct, the very same causes should make the next most common position of the breech that where the sacrum is directed *behind* and to the *right* side of the pelvis. The statistics of all observers show that this position—viz. the *fourth*, or the *right sacro-posterior* position—*is* the next most common position. Naegele gives us statistics of 163 cases of breech presentations; of these, 120 were in the *left sacro-anterior* position, and 40 were in the *right sacro-posterior* position.

In studying the mechanism of breech presentations we may take the *first* position as the *typical* one; in this position the dorsal plane of the child is in front and to the left. Before labor comes on the child sits in the uterus, its head *moderately* flexed, its limbs flexed and in more or less complete contact with its anterior plane. When the mouth of the uterus is dilated and the bag of waters ruptures, the irregularity of the presenting part permits *all* of the liquor amnii to escape; hence the walls of the uterus come into intimate contact with the child, and thus the flexion of the head is perfected and the limbs are pressed close to the fœtal body. The *first* effect of uterine contractions, then, in the second stage of labor is *adaptation*, which in breech presentations means the complete flexing of the head and the squeezing of the limbs as closely as possible to the body.

The next change is *descent*. The breech, under the propelling powers of labor, slowly descends into the pelvic cavity, the sacrum sinking down the left anterior inclined plane; and in this *oblique* position the breech reaches the *floor* of the pelvis. I shall suppose, in my description, that the inferior extremities are extended along the child's anterior surface. Having reached the floor of the pelvis, the breech of course can advance no farther in the direction in which, up to this moment, it has been urged; a *new* force—the force of *resistance*—is now impressed upon it, and a *tendency* to *rotation*, or the *resultant* movement, is developed. A *tendency* to rotation is developed, because the conditions now are not identical with those we studied in vertex presentations; in vertex presentations the head of the child, *large* and *hard*, affords ample force of resistance to secure a *complete* rotation or resultant movement, while in breech presentations, the comparatively small diameters of the breech, with its soft and yielding structure, develop but little force of resistance; and hence, constantly, rotation of the breech *does not occur at all*, or does so *only partially*. However, I am now describing a *theoretical* case, and after this explanation will suppose that a sufficient force of resistance is furnished to secure a *complete resultant* movement: under this force of resistance, in the case before us, and in consequence of precisely the same causes that give us rotation in vertex presentations, the *anterior* hip sweeps to the front and gets beneath the symphysis pubis, while the posterior hip goes into the hollow of the sacrum. The shoulders and head, tightly grasped by the walls of the uterus, do not participate in this movement, but retain their original oblique position, and hence there is a twist in the loins of the child. The *anterior* hip now becomes fixed beneath the pubic arch, while the posterior or sacral hip—*as the only part free to move*—under the influence of the propelling forces of labor *slowly* advances, sweeping along the hollow of the sacrum and the distended perineum, and describing that arc of a circle with which you are all so familiar in vertex presentations. I say the posterior hip *slowly* advances, for though I describe the change in a few words, yet in a primipara it may take hours for the soft and yielding breech to stretch the rigid tissues of the perineum and vulva sufficiently to permit even the anterior hip to appear at the opening; and after this a long time may elapse before the posterior buttock is seen, the firm margin of the rigid perineum slipping into the fissure between the nates, and defying, sometimes for hours, the efforts of Nature to free it from its grasp. Ultimately the breech is expelled. Should the shoulders have remained oblique in the uterine cavity, the loins now untwist and a movement of restitution takes place. The shoulders now engage at the superior strait, more or less nearly in the *right oblique* diameter; the arms, in a typical case, where no traction has been made on the inferior extremities, are kept by the grasp of the uterine fibres flexed and with the elbows against the sides of the thorax. In artificial breech presentations—that is, in cases of version and in all other cases where traction has been made on the lower extremities—the body is dragged away from the arms, which in consequence become extended along the sides of the head. In a typical case, then, the shoulders and arms engage, as I have described, in the right oblique diameter; the bis-acromial diameter, four inches, being, more or less accurately, in relation with the right oblique diameter, which is five inches. In this oblique position the shoulders reach the floor of the pelvis; here, in consequence of the greater bulk of the advancing shoulders, *fortunately*, a force of resistance is met much greater than that received by the buttock; and hence the resultant movement, or rotation, takes place—not always by any means, but much more frequently and much more completely than is the case with the nates. I say, *fortunately* this rotation of the shoulders generally occurs spontaneously, since *rotation of the shoulders* in *breech presentations*—whether spontaneous or whether secured by the manipulations of the medical attendant—*is of vital importance* to the subsequent successful termination of labor. This rotation of the shoulders brings the anterior shoulder, with its flexed upper extremity, beneath the pubic arch, while the posterior shoulder and flexed extremity go to the hollow of the sacrum.

The head now offers at the superior strait, *the cavity of the uterus almost empty,* while the uterine walls in consequence *exert little or no grasping power over it;* hence the rotation of the shoulders places it more or less accurately with the face looking toward one iliac fossa and the occiput to the other; and it is for this reason that *rotation of the shoulders* is of such *vital* importance in breech presentations.

The transverse diameter of the superior strait is its longest diameter, being five and a quarter inches; the longest diameter of the child's head is the occipito-mental, five inches; *hence* when the head offers at the superior strait, with the face looking to the iliac fossa—in other words, in the transverse diameter—*even though it be completely extend-*

ed, it can offer *only five inches*, and therefore can *easily* and *readily* engage and descend.

When the head engages at the superior strait in a breech presentation, an ensemble of conditions is presented peculiar and entirely exceptional; *apparently*, labor is almost terminated; the body of the child as far as the umbilicus is already delivered; when, just at this seemingly auspicious moment, a peril presents itself, so grave, a danger so imminent, that the child's life may be lost in a few moments and the labor may be greatly prolonged. This peril consists, as I have just remarked, in *a combination of dangers*. In the first place, as soon as the body of the child is delivered as far as the umbilicus, the cord must necessarily be compressed, which compression is vastly increased when the more bulky and hard head engages. This compression of the cord will vary with the relative size of the head and pelvic cavity, and also with the location of the cord; it is always dangerous, but at times it is sufficient to suspend completely the fœto-placental circulation and to occasion rapid asphyxia. Again, when the head engages at the superior strait the uterine cavity becomes practically empty; this great diminution in the size of the uterus cuts off *almost entirely the flow of blood to the placenta*, and causes at the same time *the placenta to begin to separate from the uterus;* either of which conditions will rapidly asphyxiate the fœtus even if the cord be not compressed.

Here, then, are *three inevitable conditions that cannot*, in any way, be avoided, any *one* of which will cause speedy death if prolonged for only a few minutes. *Every child* born by its breech *must experience* these conditions, and hence the fatality of breech presentations when improperly treated is easily explained.

At this moment of supreme danger, when, as we have just seen, *a few seconds of delay* may make the difference of life or death to the child—at this moment, when *every* force of labor is needed to accomplish a rapid expulsion of the head, *the force*, which until now had done almost everything, suddenly is annihilated, and the child can only be rescued from inevitable destruction by the application of *new forces* and the skill and knowledge of the attendant. The force *now lost* is that of the uterus. When the head engages at the superior strait the uterine cavity is almost empty; hence its expelling power is gone—gone at the very moment when most needed. Fortunately, the pressure which the head makes on the rectum and bladder as it sinks into the pelvic cavity gives rise to considerable irritation, and causes the mother to voluntarily strain; hence the emotion and volition of labor step in to save the otherwise doomed child at the moment when the automatic and reflex uterine forces desert it. These, then, are the peculiar conditions and dangers which belong to every case of breech presentation.

Let it be supposed now, in the case under consideration, that the head is offering properly—that is, transversely—at the superior strait; urged by the straining efforts of the mother, it engages and *reaches the floor of the pelvis in this transverse position; rotation does not take place until the force of resistance is secured;* then, and not until then, the occiput is placed beneath the symphysis pubis, while the face goes into the *lower part* of the sacrum and the distended perineum; and presently, should the *vis à tergo* be sufficient, the expulsion will be accomplished.

As has been stated, the mechanism of the *first* position of breech presentations is the *type* of the mechanism of all other positions in breech presentations; and therefore little remains to be said in order to give a clear comprehension of the whole subject. The *second* position—the *right sacro-anterior* position—has a mechanism identical with the first. In the *third* position—the *sacro-pubic*—the hips and shoulders will rotate as they did in the first position, when the head will be found, in consequence, looking more or less transversely, precisely as in a first or second position. Should, however, from any cause rotation not take place, or should the case be conducted by an ignorant attendant who does not understand the mechanism of labor, and when rotation fails to take place does not secure it by proper manipulations, then the head will offer at the superior strait — not transversely, or even obliquely, but with the face looking *directly back.* The antero-posterior diameter of the superior strait is *only four inches;* a head offering with its occiput directly in front and its face looking back is *always more or less extended;* if completely extended, its occipito-mental diameter, *five inches,* offers; if partially extended, the occipito-frontal diameter, four inches, offers to the four-inch diameter of the strait, the head cannot pass, and labor is arrested. Unfortunately, however, in consequence of the conditions which we have studied, *delay,* even for a few moments, at this period of labor is *necessarily fatal* to the child; and therefore the principle is clearly established that *rotation of the hips* and *rotation of the shoulders* in breech presentations are almost essential to the *successful termination* of labor for the child.

The mechanism of the sacro-posterior positions can also be stated in a few words. Take the *fourth* position, or the *right sacro-posterior* position, as the type; here the dorsal plane of the child looks behind and to the right; the breech descends, the sacrum of the child sinking down along the right sacro-iliac synchondrosis, and *in this oblique position* it reaches the floor of the pelvis; rotation now occurs, which brings the *anterior* hip to the symphysis pubis, and *the hips and shoulders* are finally expelled, *precisely as in sacro-anterior positions.* This rotation of the hips and shoulders *necessarily* places the head *transverse* at the superior strait, and the labor terminates by the occiput getting beneath the pubic arch, just as if the case had been a primitive sacro-anterior position. Should, however, from any cause, complete rotation of the hips and shoulders not take place, the head of course will not be made to assume the transverse position at the superior strait, but will engage and descend in the oblique diameter; in most instances, even in this case, as soon as the head meets the force of resistance the occiput rotates to the pubic arch. Sometimes this anterior movement does not occur, but the occiput goes into the hollow of the sacrum, while the face gets *behind* the symphysis pubis; as the descent of the head progresses the nape of the neck rests against the anterior edge of the perineum, and the head is finally expelled, *the face* appearing beneath the arch. The *fifth* position, the *left sacro-posterior*, has a mechanism identical with the fourth. The *sixth position*, the *sacro-sacral*—like its analogue, the sacro-pubic—may have rotation of the hips and shoulders, which causes the head to assume an oblique or even a transverse position at the superior strait, and the labor terminates by the occiput going into the hollow of the sacrum, or at times even coming beneath the arch. In certain rare cases rotation might not happen; then the head would offer at the superior strait more or less extended and with the face directly in front; of course it could not pass in this position, and labor would be impossible; at last, however, delivery might be secured by the following mechanism: The chin might be forced well over the top of the symphysis pubis, and the anterior part of the child's neck be pressed closely against the inner surface of the symphysis; if, now, the expelling effort were very strong, the occiput—as the only part of the head free to move—might descend into the pelvic cavity along the hollow of the sacrum, and finally the head might be expelled, the *anterior* part of the neck getting under the arch of the pubis and the occiput appearing *first* at the vulva. Such a mechanism, implying as it does a greatly prolonged labor, would necessarily be fatal to the child.

We come now to the all-important subject of the treatment of breech presentations. It is evident, after the description given, that the earlier parts of a labor by the breech are tedious—that the danger to the child does not begin until its body is born as far as the umbilicus and the head engages at the superior strait; it is also evident that, though the *earlier* parts of labor may last for many hours without detriment to mother or child, the *final part*—that is, the delivery of the head—*after it begins to engage at the superior strait* cannot be *prolonged many minutes without necessarily* causing the death of the child. It is clear, too, that at this supreme moment, when the child's fate hangs in the balance and a very rapid termination of labor *alone* can save it—that at this supreme moment the *chief force* of labor *up to this time* is suddenly annihilated, and unless a *new force* or forces be applied, either by Nature or by the attendant, the child cannot be saved.

From these considerations, then, the following conclusions may be drawn: In breech presentations the *first* stage of labor should be *thor-*

oughly accomplished before the second stage begins. Hence *never* rupture the bag of waters, knowing how very valuable it is in dilating, safely and thoroughly, the external organs; the woman should be kept quiet, so that no movement on her part may cause a premature rupture of this important dilator.

During the second stage of labor there should be made no attempt to hasten the delivery of the breech; it may be hours, especially in a primipara, before the soft and yielding nates overcome the resistance of a rigid perineum; yet this delay is not dangerous, while it secures a *complete stretching* of the structures, through which, at the close, we wish to bring the head with great rapidity. In this part of labor, then, the only precaution necessary is to favor or cause *rotation of the hips.*

At last the breech is born; the lower extremities, if not before, are now extended and delivered; these in a *natural labor* should be merely supported, and the delivery trusted to Nature until the body is expelled as far as the umbilicus. The cord should now be pulled a little down, so that it may not be too much stretched, or if it be between the nates it should be freed and brought opposite one of the sacro-iliac symphyses.

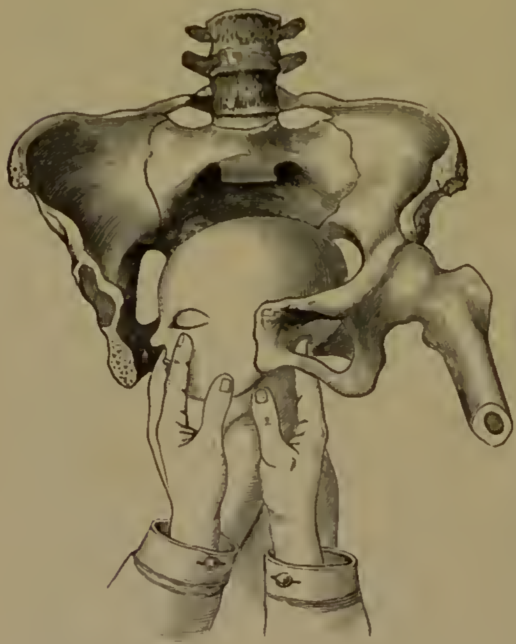
About this time the uterine force is rapidly failing and *new forces* must be applied. One of these *new* and *indispensable* forces is the voluntary bearing-down efforts of the mother. The woman should be directed to use her utmost effort; the emotion of labor should be stimulated by assuring her that the safety of her child in great measure depends now upon herself. Under this *new* force the shoulders rapidly descend, the arms in a typically natural case flexed and the elbows in contact with the sides of the thorax; should, however, one or both arms become extended, they must be brought down in the way described in the treatment of *artificial* breech presentations, or version. As soon as the shoulders have reached the floor of the pelvis *prompt* and *complete* rotation must be secured by forcing the posterior shoulder into the hollow of the sacrum; this movement places the head *transverse* at the superior strait; in which position, even if it be *completely extended,* there will be ample room to permit rapid descent and delivery. Here the supreme moment of labor is reached; the process may have lasted *safely* up to this time for many hours, but now a *few minutes of delay* are fatal. The question, then, is how to secure the quickest delivery. The uterine power is lost; traction on the body of the child not only extends the head, but may *damage the spinal cord beyond the possibility of recovery;* a *vis à tergo* is required rather than *any force from the front,* and we supply this *vis à tergo* by directing the mother to *strain to her utmost;* supporting the body of the child, two fingers should be insinuated along the *side of the pelvis*—the head, recollect, is *transverse*—and placed at the root of the nose, or, if this cannot be done, in the mouth; the fingers of the other hand should be placed supportingly on the *back* of the head. In much less time than has been occupied in giving these directions the head descends into the pelvic cavity; *when it has reached the floor of the pelvis*, and *not until then*, the rotation of the occiput to the symphysis pubis should be secured, and in a few seconds, the mother continuing her straining efforts, the child will be expelled.

All works on Obstetrics show the head *rotated, with the face in the hollow of the sacrum, before* it has reached the floor of the cavity; assistance is represented as rendered by the fingers *inserted along the perineum.* The posterior depth of the pelvic cavity is five inches for the bony pelvis, and four or five inches for the distended perineum—in all, say *nine or ten inches;* hence it is evident that when the face is *where the books represent it to be*—viz. in the hollow of the sacrum—your fingers will scarcely reach beyond the coccyx, and you *will not be able* in ordinary cases to apply them *as represented on* the sides of the face.

The accompanying drawing will illustrate a very important principle in the proper management, not only of breech presentations, but also of version.

The head is represented as *transverse* in the pelvis; the lateral depth of the pelvis is three and a half inches; *hence when the head is transverse*, the fingers, inserted on the *side of the pelvis, can easily reach to the superior strait*, and can easily be applied to the root of the nose, or in the mouth, as shown in the drawing, and the head can *quickly* and readily be *conducted—still in the transverse diameter*—to the floor of the pelvis.

Fig. 262.



Breech Presentation: head transverse in pelvis.

We constantly meet with cases where the mother cannot supply the necessary expelling power, or does so inefficiently, at the moment when the child is doomed to certain destruction unless delivered rapidly. Here the almost universal practice is to apply the forceps. An obstetrical writer and teacher can scarcely be found who does not direct in cases of breech presentation to have the forceps ready, and, when the moment of great peril comes, to apply it. Now I wish to be understood as stating absolutely and positively *that the forceps* is *seldom or never required* in the delivery of the head in breech presentations. The use of this instrument, so universally recommended, is a *rough, unintelligent* application of *unnecessary* and *badly-applied force.* A thorough knowledge of the mechanism and physiology of breech presentations reveals forces amply sufficient to accomplish the much-to-be-desired speedy delivery of the head; in other words, *the power* in such cases should reside in the well-instructed brain of the intelligent practitioner, and not be sought for in the rude grasp of his iron instrument.

When treating a case of breech presentation where the head has reached the superior strait, and the mother cannot supply the necessary expelling power, *do not think of the forceps, but apply the hand or hands on the lower part of the abdomen,* or an assistant can make the pressure needed, and *press directly down on the head;* it is easy by this proceeding to *apply any amount of vis à tergo,* and to *supplement entirely* the lost force of the uterus and the lost force of the mother's efforts. Never forget that in almost all cases of breech presentations the forceps is unnecessary, and that the rapid delivery of the head can always be *easily* and *quickly* secured *by the bearing-down efforts of the mother,* aided, or even *replaced, by the bearing-down efforts of the attendant.*

DEVIATED BREECH PRESENTATIONS.

In certain cases of uterine obliquity the breech offers obliquely at the superior strait. It may be a hip or the sacrum or the posterior part of the flexed thighs. In all such cases the part thus offering obliquely cannot engage, and it becomes necessary to bring the breech fairly to the superior strait.

The hand must be introduced, and the presentation must be properly modified: in accomplishing this it might be necessary to bring the lower extremities down into the pelvis (as in version by the feet). Should this be done, the case will not be complicated at all, but requires only the usual treatment for breech presentations.

PRESENTATIONS OF THE TRUNK.

Trunk presentations are not very common; they occur about as frequently as face presentations, perhaps about once in 250 cases. The causes of trunk presentations are discussed in our remarks on the natural causes of presentation and position. These causes are uterine obliquities; twin labors, the second child frequently offering by the trunk; placenta prævia; small size of child; large amount of liquor amnii; abnormally-shaped uterine cavity; deformities at the brim of the pelvis, etc. etc.

DIAGNOSIS OF TRUNK PRESENTATIONS.

(*Cazeaux.*)

There is sometimes reason to suspect a trunk presentation even before the commencement of labor from the following signs: The abdomen is much larger in its transverse diameter than usual, and when its walls are soft and flabby they can often be depressed enough to detect the fœtal head in one of the iliac fossæ, presenting there as a hard, rounded, and resistant tumor; then by placing the hands opposite each other in the lumbar regions a greater and firmer resistance, offered by the two extremities of the fœtal ovoid, will be felt at these points, and the solid body formed by the child may be readily moved from side to side, thus proving that its long axis lies transversely above the superior strait. Finally, the tumor formed by the head in the vertex presentations is no longer detected by the vaginal touch, and it is almost impossible to reach the presenting part. In some rare instances the elbow or the hand of the child may be recognized and balloted; and this sign, accompanied by the first two, renders the diagnosis quite probable.

The form of the abdomen is then very irregular, especially if the uterus should contain but a small quantity of amniotic fluid. It has, however, been observed that after the discharge of the waters the longitudinal diameter gradually becomes greater than the other, because the transverse position has no longer a real existence, for the body of the fœtus is so curved upon itself that one of its extremities is lodged in the fundus of the uterus, although the other does not correspond to its orifice.

We do not believe that auscultation is capable of throwing any light upon the diagnosis. Sometimes, however, it may prove a useful auxiliary. If, for example, a small member of the fœtus be detected by the touch, and the pulsations of the heart are heard in the hypogastric region, we may conclude almost certainly that the member belongs to the upper extremity. Should the heart be heard on a level with the umbilicus, it would most probably prove a pelvic extremity.

Before the membranes are ruptured, the elevation of the part renders the vaginal touch very difficult; and so, of course, the form of the bag of waters or that of the uterine orifice can be of but little service. It is said the os uteri dilates more slowly, but as this slowness of dilatation is met with in all presentations excepting those of the vertex, it forms a sign of minor importance. The touch, therefore, can only give a positive certainty after the rupture of the membranes. When the side is the presenting part, the shoulder is very frequently found at the centre of the superior strait, as also the elbow or the side of the chest, and hence will be the first encountered by the finger in making an examination; and we therefore have to point out the characters successively whereby these several parts may be recognized.

When the shoulder presents, the finger first detects the rounded tumor formed by its summit, upon the surface of which a small osseous projection, constituted by the acromion, is distinguished; then, behind or in front, according to the position, the clavicle and the spine of the scapula are felt, and below the scapula there is only a plane surface, terminated by the acute inferior angle of this bone, which is movable and permits the finger to slip under it; lastly, on the sides of the tumor formed by the shoulder the axillary space can always be distinguished, and sometimes also (though on the opposite side) the depression in the neck can be felt.

The shoulder being once recognized, we must next determine which one it is and what is its position. I will remark, in advance, that we have admitted but four positions of the trunk—namely, two for the right shoulder and two for the left—and that the relation existing between the situation of the head and that of the child's posterior plane is different in each of these four. Thus there are two positions where the head is to the left—namely, the first position of the right and the first of the left shoulder—and remark that in the latter the child's back is turned toward the mother's loins; in the former, on the contrary, it is in front; and therefore whenever the head is to the left and the child's back is behind we have to treat with a first position of the left shoulder.

In the same way there are two positions in which the head is to the right—to wit, the second of the right and the second of the left shoulder; but again observe that in the latter the back looks forward, while in the former, on the contrary, it is directed posteriorly. Hence to recognize a second position of the left shoulder it will only be necessary to ascertain that the child's head is turned toward the mother's right side, and that its back looks anteriorly. In a word, to satisfy ourselves which is the presenting shoulder, and what is its position, we only have to find out where the head lies and the position of the posterior plane of the child.

The shoulders presenting and being recognized, it is evident that if the axillary space looks toward the mother's right the head will be to her left, and *vice versâ;* consequently the situation of the head is readily known by the direction of this space, and, as regards the child's dorsal plane, the omoplate will clearly indicate its position.

When the elbow alone is accessible to the finger, it may be recognized by the three osseous projections (the olecranon and the two condyles) which it presents, by the transverse convexity in the bend of the elbow, and by the vicinity of the chest and intercostal spaces. The elbow having been distinguished, it will be necessary to make out the position to ascertain where the fœtal head and its dorsal plane lie; but this is now comparatively easy, since the elbow is always directed toward the side opposite to that where the head is found, and the forearm is always placed on the anterior plane.

Again, as above stated, it happens at times that the forearm is not doubled up, but that, on the contrary, the hand hangs down in the vagina or even appears at the vulva. Now, to determine which is the presenting hand in those cases it is necessary to turn it in such a way as to place its palmar surface in front and above; for in this position if the thumb be directed to the mother's right thigh it is the right hand, but if to the left thigh it is the left hand; and then, to find out where the head is, the accoucheur must slip his finger up to the axillary space.

When the hand comes out at the vulva a careful inspection of it will most generally be sufficient to establish the diagnosis. Thus, if its dorsal surface is turned toward the patient's right thigh, the head is at the right, and if to the left thigh, the head is at the left. The little finger directed toward the coccyx indicates that the child's dorsal plane corresponds to the mother's loins, and the same finger pointing to the pubis is an evidence of this plane being in front.

We have been thus particular in the diagnosis because it is all-important in trunk presentations to understand clearly which side presents at the strait, since the accoucheur must always endeavor to turn; and if the details just given prove difficult of comprehension from a simple reading, we hope they will become clearer by practising on a manikin.

Mechanism of Trunk Presentations.

In a trunk presentation the child may offer any part of the trunk, but for the purposes of description and treatment all trunk presentations may be classified into two positions—viz. presentations of the right and left sides. When the head of the fœtus is turned to the left side the position is called the first position of the presenting shoulder, the left cephalo-iliac position. When the head is directed to the right side, we term the position the second position of the presenting shoulder—the right cephalo-iliac position.

Before entering on any discussion of a possible mechanism of labor in trunk presentations, it will be proper to state that, as far as treatment is concerned, a trunk presentation has no mechanism; that is, that a trunk presentation is always, practically, to be looked upon as an impossible case of labor—is never to be trusted to Nature—is always promptly to be assisted. After this positive statement it may not be amiss—rather as a matter of scientific curiosity than for any sure guide to treatment—to describe how Nature sometimes terminates these cases spontaneously.

There are two mechanisms by which a trunk presentation may terminate. One of these is called spontaneous version, the other spontaneous evolution.

First, of spontaneous version. By spontaneous version is meant a spontaneous change in the presentation of the child, in consequence of which the fœtal ellipse revolves in the cavity of the uterus in such a manner as ultimately to cause one or the other pole of its long axis to offer at the superior strait, when the case may terminate without difficulty. Spontaneous version is more possible before the rupture of the bag of waters than after. At this period, though labor has actually commenced, the fœtus sometimes exhibits great latitude of motion in the amniotic cavity, and in consequence may change its position; and in this way the child has been recognized as offering many parts of its surface before the presentation became fixed, after the escape of the liquor amnii.

But even after the escape of the liquor amnii, in some rare cases, this movement has taken place. Perhaps the most satisfactory explanation of the cause of spontaneous version after the escape of the liquor amnii, when the child is tightly grasped by the walls of the contracted uterus, is the theory that it is generally owing to irregular and partial contractions of the uterus (Cazeaux).

We may suppose a case of trunk presentation where many hours have passed in useless effort; finally, the uterus becomes worn out and exhausted, and falls into the condition of irregular contraction, as it is termed. That is, only a part of the organ contracts, while the rest remains absolutely paralyzed and incapable of offering any resistance. We may suppose that one side of the organ contracts and the other half is inert. The contracting side acts on one pole of the fœtal ellipse and pushes it down toward the cavity of the pelvis, while at the same time the paralyzed side offers no resistance to the ascent of the opposite pole to the fundus. Should this condition last long enough, the fœtus would eventually become completely turned in the cavity of the uterus; one of its poles would offer at the superior strait, and labor might terminate spontaneously.

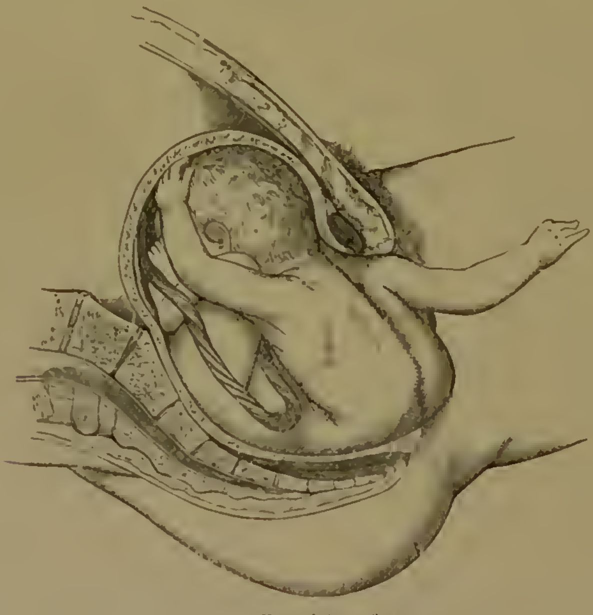
The second mode by which a trunk presentation may terminate spontaneously is called spontaneous evolution. Spontaneous evolution is a regular mechanism by which, in very rare and exceptional cases, a trunk presentation is delivered, not by a change of presentation, as in spontaneous version, but delivered as a trunk presentation.

We may take as our illustrating example the first position of the right shoulder, the left cephalo-iliac position.

As soon as the bag of waters ruptures, as the presenting side does not stop up the mouth of the uterus, all the liquor amnii escapes; the uterus contracts strongly, and the child is bent in the direction of its long axis toward the side opposite the presenting one. In other words, Nature makes an unsuccessful attempt to cause the presenting side to offer by the smallest diameters possible in order to secure its engagement and descent. Hence in a trunk presentation, as in all other presentations that we have studied, the first effect of uterine contractions after the waters escape is to adapt (in this case to try to adapt) the presenting part to the diameters of the superior strait.

The long axis of the fœtal ellipse, however, even when bent as much as is possible, cannot pass any of the diameters of the pelvis. The next effect of the propelling forces is to push the presenting shoulder into the cavity. The shoulder now descends—how far? Only as far as the length of the side of the child's neck will allow; that is, for about an inch and a half; a further descent would imply that the child's neck was of abnormal length—the neck of a human giraffe—or a simultaneous engagement of the head and trunk, which is impossible. The shoulder, now coming in contact with some part of the anterior inclined plane, especially if the arm should be down and in the vagina, *may* meet sufficient force of resistance to impress upon it a resultant movement, and rotation of the shoulder might take place. This rotation of the shoulder would bring the presenting shoulder to the arch of the pubis, the head moving to the front and getting over

FIG. 263.

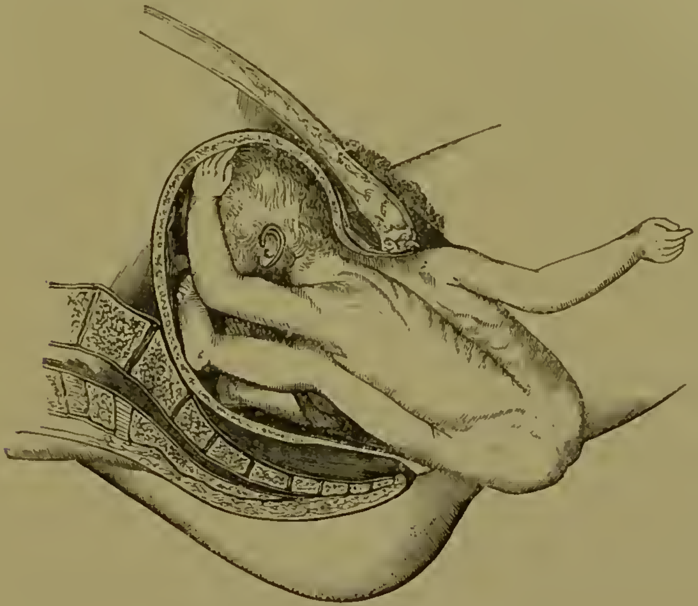


Spontaneous Expulsion, first stage.

the horizontal branch of the pubis, and the breech placing itself over the opposite sacro-iliac symphysis.

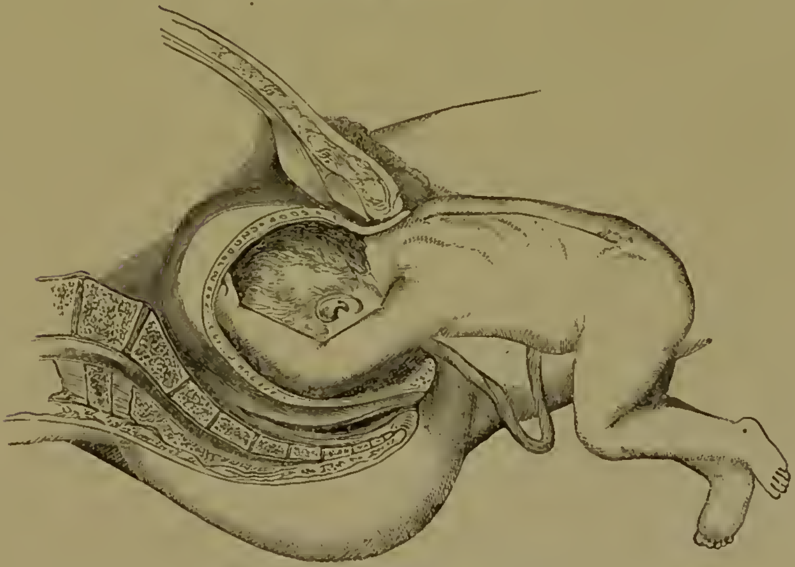
This rotation of the shoulder to the symphysis pubis has brought it to that part of the pelvis where the length of the side of the neck is sufficient to reach from the superior to the inferior strait. Hence the shoulder sinks down behind the symphysis pubis, and ultimately gets

FIG. 264.



Spontaneous Expulsion, second stage.

FIG. 265.



Spontaneous Expulsion, third stage.

beneath the arch of the pubis, the forearm and arm appearing at the vulva and the side of the neck being pressed strongly against the inner surface of the symphysis. The shoulder now is arrested, and can advance no farther; finally, the trunk is forced, doubled up, into the cavity of the pelvis. The acromion remaining fixed under the symphysis, the breech, as the only part of the body free to move, is forced along the hollow of the sacrum and the hollow of the distended soft parts, and at last the doubled-up body is expelled, the breech describing around the shoulder, resting on the subpubic ligament, an arc of a circle the radius of which is measured from the top of the shoulder to the coccyx, and which is about five or five and a half inches in a fœtus of normal size and much compressed. As soon as the body is expelled the head engages and is delivered as in a breech presentation.

The circumstances favoring spontaneous evolution are very evident: smallness of the fœtus; large pelvis, and the maternal soft parts offering the minimum resistance; and, finally, the maximum expelling powers. Spontaneous evolution, though occurring under the most favorable conditions, is yet most undesirable and disastrous to both mother and child. The mother is exposed to all the dangers of a very long and painful labor, during which all the parturient tissues are subjected to a continued pressure. She may, therefore, speedily die after such a labor, or experience injuries from subsequent inflammation and sloughing that may make death itself preferable. The child also is exposed not only to all the dangers of long and continued pressure, but to all the dangers we have recognized as attending a delay in the delivery of the head in breech presentations.

Velpeau gives statistics of 137 cases of spontaneous evolution. 125 of these children were stillborn, and of the remaining 12 children alive at birth, all, or almost all, must have died very shortly after in consequence of the injuries received during labor.

TREATMENT OF TRUNK PRESENTATIONS.

In view of the danger of trunk presentations it has been recommended, when the presentation is recognized during the latter days of gestation and before labor comes on, to attempt by external manipulation to change the presentation to either pole of the long axis of the fœtus. The practice, however, for many reasons easily evident, is not endorsed by the best authorities.

When labor has actually begun, bearing in mind that Nature brings about spontaneous version, especially before the escape of the liquor amnii, we may try to imitate her by resorting to abdominal palpation. We may try, by acting on the two poles of the fœtal ellipse through the abdominal walls, to cause one pole to descend and the other to move to the fundus, or we may resort to bipolar version by using one

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but when it cannot be avoided, t re is to introduce the hand, seize a lower extremity, and simply drag it into the vagina, and then terminate the case as any case of version by the feet should be managed when the welfare of both mother and child must be consulted.

Sometimes, however, the shoulder is so jammed down into the superior strait, and the walls of the uterus are so firmly contracted on the child, that the introduction of the hand into the cavity of the uterus becomes an impossibility, or so dangerous that it must not be even thought of. Under these circumstances—and they are not at all uncommon, especially in a consultation practice; that is, a practice called to assist in cases that have been improperly treated, or "trusted to Nature" for a long period—the best proceeding is that recommended by Professor Wright of Cincinnati, in which he advocated bipolar version, in these previously unmanageable cases, long before this method of version was known or practised. Shortly after Dr. Wright had published an account of his method, giving at the same time several illustrative cases, I met with a case which so happily shows the difficulties where version by the feet is impossible, and at the same time the incomparable value of the Wright method over all others, that I think I cannot do better than to report it entirely, inasmuch as in such instances, when version becomes impossible, nothing remains but embryotomy.[1]

The following is a history of the case which I take from my notes:

On the evening of the 3d of April I was called by a midwife to see Mrs. M—— as a case of difficult labor which she could not manage. On reaching the patient I learned that she had been taken in labor some time in the morning, that at two o'clock she had given birth to a child, and that the midwife, on making an examination, discovered a second child presenting by the shoulder, its arm being in the vagina.

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[1] Reported in *Medical Examiner*, July, 1855.

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in the afternoon. I did not see the patient
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found her with the uterus contracted spasmodically
d, suffering a great deal of pain in consequence, whilst
on had not been at all improved by brandy freely given by
wife.

n making an examination I found the arm in the vagina consider-
bly swollen, the shoulder at the superior strait, the head high up in the right iliac fossa, being readily felt through the abdominal walls, the back of the child toward the symphysis pubis. Having carefully diagnosed the position of the child, I determined to resort to version by the *feet*, but met with so much difficulty from the firm contraction of the uterus, together with the great irritability and restlessness of the patient, who rolled and struggled violently when I attempted the operation, partly no doubt from the effects of the brandy she had taken, that I was forced to desist. I then determined to try the plan of treatment as suggested by Dr. Wright, which consisted, as the first step, in carefully returning the arm into the cavity of the uterus—which was not very difficult—and then with two fingers on the shoulder I endeavored not so much to push it up as to slide it away from the superior strait, attempting, in fact, to imitate spontaneous version by causing the whole body of the child to revolve in the cavity of the uterus; this action upon the shoulder was very much facilitated by an external manipulation, through the abdominal walls, upon the head in the iliac fossa, which consisted in attempting to force it toward the superior strait. To my surprise, the shoulder readily yielded and ascended; the next minute, still continuing the process, the neck, and shortly after the side of the head, were felt at the superior strait, and then by a little more manipulation the vertex was brought down in the left occipito-anterior position. The moment the head was placed in the proper position the patient expressed herself completely relieved from the severe pain she had been suffering for hours.

For a time the uterus ceased entirely to act, but pains coming on, they were stimulated by ergot, the parts having been dilated by the passage of the first child, and in about an hour after the child was born ALIVE.

It is proper, however, to state, as explaining, to a certain extent, the facility with which the operation was performed, that the child weighed only five pounds, yet, on the other hand, it should be recollected that the smallness and mobility of the child is perhaps the most common cause of shoulder presentations; and hence in such presentations we may expect, very generally, to have small children to deal with, and moreover that version by the *feet* had been attempted and had not been accomplished.

It might be urged that as the child was not large, the case might have been left to Nature and labor terminated by spontaneous evolution. But what are the facts of the case? Five hours had elapsed since the rupture of the membranes, and one of the earliest changes noticed when spontaneous evolution takes place had not yet occurred: I refer to the rotation of the presenting shoulder to the symphysis pubis as preparatory to its engagement beneath the arch; indeed, the spontaneous expulsion of the child in these cases is the exception, not the rule; and when it does happen, if we think for a moment on the mechanism of labor by which delivery is accomplished, we cannot fail to perceive that the mother must be exposed to all the dangers attending a long and painful labor, while the child is so powerfully compressed that death is the general result.

It is asserted by some that an error of diagnosis has existed in those cases where it is stated that version by the vertex has been successfully performed in shoulder presentations—that they have been really cases of head presentation complicated by a descent of the arm. But this certainly was not so in the case to which I refer, the head being distinctly felt in the right iliac fossa through the abdominal walls, whilst the partial introduction of the hand into the cavity of the uterus in the attempt to make version by the feet enabled me perfectly to recognize the position of the child.

Again, it is said that the operation of version by the vertex is a very difficult one; that we cannot, without subjecting the mother to very great danger, push up the presenting part of the child and search for the head; and then, having found it, that we cannot grasp the round and slippery occiput and bring it to the superior strait. This objection in many cases may be well founded, but the operation which I have related consisted rather in pushing the shoulder away from the superior strait, causing thereby the child to revolve in the cavity of the uterus; of course as soon as such a motion of rotation is communicated to it by pushing away the shoulder, we must of necessity have some other part brought to the superior strait, which part will be first the neck, then the head, and by a little manipulation the occiput can be brought down, and an *impracticable* case of labor can be thus changed without, or with comparatively little, pain to the patient, and in a few minutes, to one of the most simple character; and not only thus changed, but effected without exposing the child to the great risks to which it is always liable when version by the feet is resorted to; and if an attempt to make version by the vertex should fail, without giving our patient any more pain, our hand being in the vagina, our fingers in the mouth of the uterus, we can most easily, if the case admit of it, pass our hand upward, grasp the feet, and bring them down.

Finally, should all our efforts to secure delivery by version by the feet or by version by the vertex prove unavailing, we must not desist from our attempts to terminate the case. The history of spontaneous evolution and its necessarily fatal results to the child shows that we must now only regard the welfare of the mother; and this demands prompt performance of embryotomy.

Embryotomy in these cases usually is not difficult. Under no circumstances should the arm in the vagina be (as has been done) amputated as a preliminary proceeding. Such method merely deprives the operator of a most valuable tractor after the head is amputated, and does not facilitate in any way the operation. A blunt hook is now to be used to drag the neck well down into the pelvis. The head is then to be separated from the body. For this purpose nothing is better than Ramsbotham's decapitator (a blunt hook with a cutting concave edge). Usually, however, the country practitioner will not have access to this instrument, and some other will have to be thought of. I know of nothing more efficient, and less likely to injure the mother, than an improvised écraseur consisting of a piece of stout and rather rough cord. This cord is to be gotten over the neck, and then by a little dragging and sawing movement the cord speedily cuts its way through. As soon as the head is separated, the body is to be delivered, and finally the head. This latter can generally be easily removed by carrying out the principles of treatment laid down for the management of the delivery of the head in breech presentations.

THE MECHANISM OF THE THIRD STAGE OF LABOR.

By the Editor.

In sharp contrast to our definite knowledge of the mechanical laws that govern the expulsion of the fœtus stands our uncertainty in regard to the method by which the placenta is separated from the uterus and is expelled through the birth-canal. "If" says Berry Hart,[1] "the delivery of the placenta depended on obstetricians knowing how it separated, no woman in labor would complete her third stage;" but, unfortunately, this author adds to the confusion surrounding the subject by advancing a theory in explanation of the separation that is, to the writer's mind, quite untenable.[2]

The third stage of labor may be divided into two acts: (1) the separation of the placenta from the uterine wall; and (2) its expulsion

[1] *Edinburgh Medical Journal*, 1887.

[2] Dr. Hart claims that "the placenta separates, not from diminution of the placental site, but during the expansion in area of the site after retraction." A glance at Fig. 266 will show the fallacy of this assertion.

from the uterine cavity. These two processes are most conveniently considered separately.

The Separation of the Placenta.—It is usually asserted that the placenta is separated from the uterine wall by a diminution in the area of the placental site, but without further qualification of this statement it should follow that with every uterine contraction during labor, and especially in the last stages, when the child's body is partly without the uterine cavity, the placenta must be more or less forced away from the uterine wall; whereas, actually, the placenta is not separated at once, even when the fœtus has entirely vacated the uterine cavity and the uterus has been very much reduced in size. To explain the adhesion of the placenta to the uterus in spite of uterine contractions during and immediately after labor, it is only necessary to recall the peculiarities of the placental structure, resembling nothing so much as a sponge, with the branching villi separated by intervening blood-spaces. The spongy placental mass can follow the retraction of the uterine wall until the solid villi are brought into actual contact with one another and the whole placenta forms a perfectly solid mass; as soon as that point is reached, the slightest additional contraction of the uterine muscle, with the smallest decrease in the area of the placental site, springs off instantly the entire placental mass, which can no longer be compressed.

This, the writer conceives, is the mechanism of the separation of the placenta in a strictly normal case, and no other cause need be operative to effect the detachment of the placenta from the uterus. The extent to which the placenta can follow the retraction of the uterus has been shown by Barbour,[1] who found a diminution of placental area to about one-half its normal extent (4 inches by 4½ inches) before the placenta became detached from the uterine wall. This strictly normal mechanism is, however, capable of considerable variation in the individual case. The detachment of the placenta as a whole may not occur instantaneously, but not infrequently the central portion separates first, and as the periphery of the placenta is brought nearer to the centre of the placental site, the placenta bulges out into the uterine cavity, leaving a vacant space behind itself which immediately becomes filled with blood.[2] To this retro-placental effusion of blood some would attribute the separation of the placenta, but it is evidently an effect and not a cause, for it is not constant, and the amount of blood is rarely sufficient to push the placenta off from the uterus, even were it conceivable that the blood is forced out of the vessels with such violence as to remove an obstruction weighing a pound or more. Occasionally, one part of the uterine muscle seems to contract with more vigor than another,

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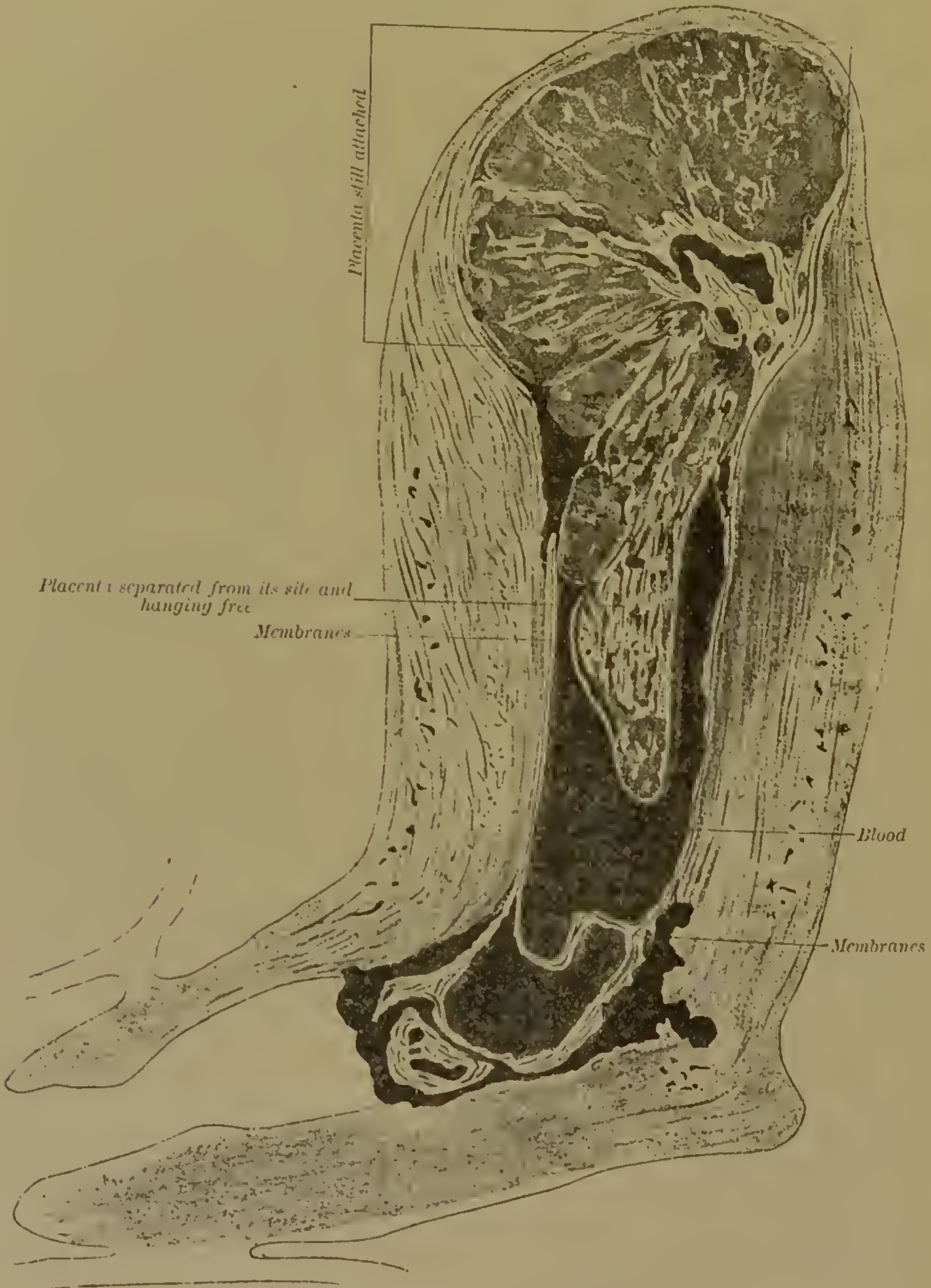
[1] "Sectional Anatomy of Labor," *Edinb. Med. Journ.*, Oct. and Nov., 1887.

[2] See the observations made by Stratz and Barbour, who introduced their hands into the uterine cavity immediately after the expulsion of the fœtus: *Die Nachgeburtsperiode; der Schwangere u. kreissende Uterus;* and *Edinb. Med. Journ.*, Oct., 1887.

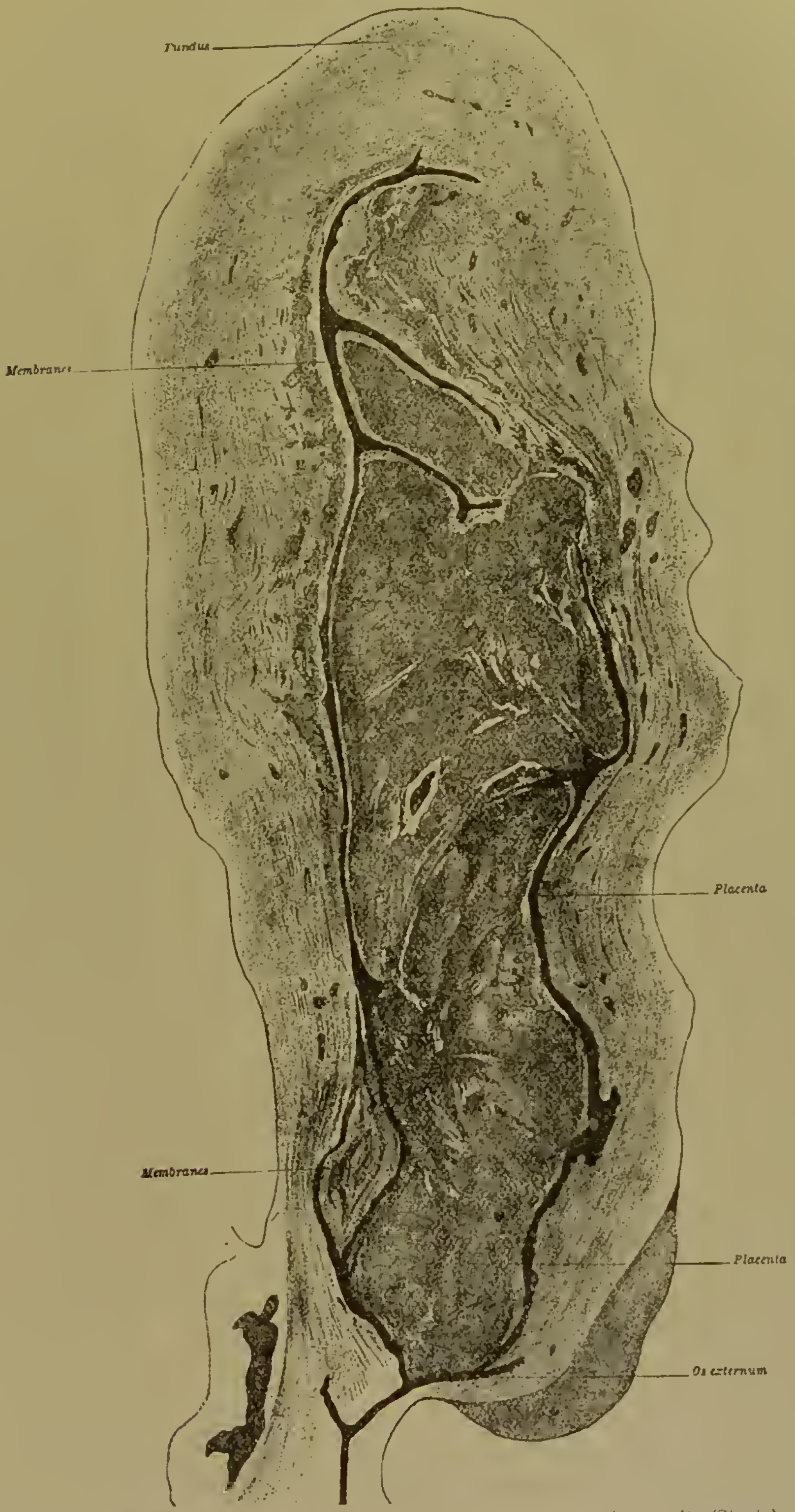
FIG. 266.



In which the Placenta is Partly Adherent (Stratz).

or else one portion of the placenta adheres more closely than another. At all events, the condition shown in Fig. 266 is the result—a separa-

FIG. 267.



Representing Placenta Separated, but still lying in uterine cavity (Stratz).

tion of the whole placenta not simultaneously, but after two or more contractions, each of which forces away a greater or less area.

It must often happen that the same uterine contraction which at first so diminishes the area of the placental site as to force off the placenta from the uterine wall is, immediately after the separation of the placenta, at once converted into the detruding force that expels the latter from the uterine cavity. In such cases it would be difficult to detect the dividing moment between separation and detrusion, one seeming to be but a continuation of the other; and it is this circumstance doubtless that has led some observers to advance the theory that the placenta is separated not only by the diminution of the placental site, but also by being grasped and pushed off from the uterine wall by the action of the uterine muscle. This latter action, however, need not be called upon to explain the separation in a strictly normal case. That the detruding action of the uterine muscle may in some instances play a subordinate rôle in the separation of the placenta cannot be absolutely denied, but that in all cases the uterine walls grasp the placenta and push it off from its attachment, the writer, having in several instances introduced his hand into the uterine cavity before the separation of the placenta to investigate this point, cannot believe.

THE EXPULSION OF THE PLACENTA.—The placenta, being detached from the uterine wall, is either immediately expelled from the uterus, or else, resting a while quite detached within the uterine cavity, as shown in Fig. 267, is ultimately cast out by the uterine muscle into the cervical canal and upper portion of the vagina. Although the placenta separated from its attachment and acting as a foreign body is soon expelled from the uterus, rarely remaining unattached more than fifteen or twenty minutes, it may rest a very long time in the upper portion of the vagina and in the cervical canal without exciting the benumbed and almost paralyzed muscles of these regions to action. It is on this account that, in the civilized female at least, one cannot always trust to nature to end the third stage of labor, as was once recommended by William Hunter and his school, for as long as the placenta is retained there is some danger of hemorrhage, and it is possible for the expulsion to be so long delayed that the succulent placental mass undergoes decomposition and becomes a sure source of septic infection.[1] The placenta leaves the uterine cavity and emerges from the vulva in one of two ways—either edgewise, or else after inversion of the ovum with the fœtal side foremost. As to which of these two methods is the normal one, there is considerable difference of opinion. Baudelocque,

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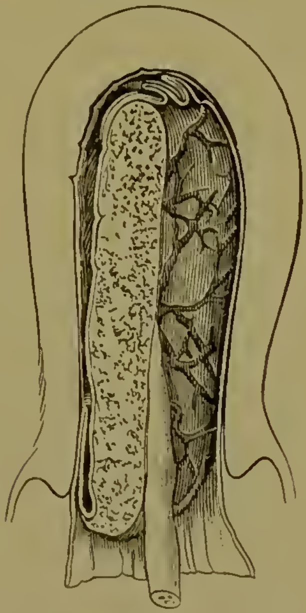
[1] While the writer was volunteer interne in the lying-in hospital of Munich it was customary in one delivery-ward to allow the placenta to remain undisturbed for two hours, and in another for twelve hours: in a large proportion of these cases expression was finally necessary.

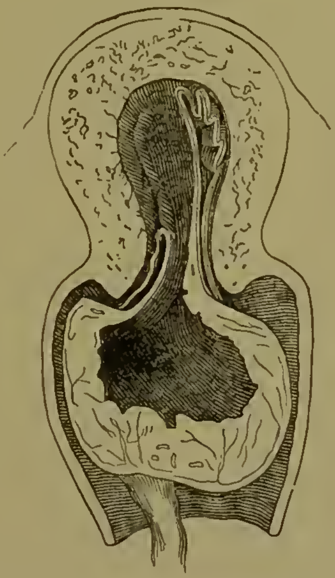
Schultze, Stratz, Tarnier, and others claim that the placenta, being heavy, sinks down to the cervix, pulling the membranes after it, and usually appears like an "inverted umbrella;" and my own observation leads me to take this view. It is admitted by all that if the placenta is attached to the fundus uteri, the ovum is more likely to be inverted, and the same result may be produced by traction upon the cord. Matthews Duncan, Barbour, and others assert that the placenta is most frequently extruded edgewise, the membranes covering the fœtal aspect. Duncan goes so far as to maintain that inversion of the ovum is the result of manual interference.

FIG. 268.



Placenta emerging Edgewise (Duncan).

FIG. 269.



Inversion of the Ovum and Expulsion of the Placenta as an Inverted Umbrella (Schultze).

NOTE.—For the Anatomy of the Gravid Uterus, and the Mechanism of the Closure of the Blood-vessels after Delivery, see pp. 327, 328.

ON THE USE OF ANÆSTHETICS IN LABOR.

By J. C. REEVE, M. D.,

Dayton, Ohio.

> "The teachings of etherization, then, come from experience. . . . And he who has studied these in their diverse phases the most faithfully is he who will most safely, because most wisely, employ it."—Channing.

Historical.—The history of surgical anæsthesia is well known. All through the ages there had been attempts to relieve the pain of surgical operations. Then came suggestion, under the light of advancing chemistry, that was followed by the efforts of some, the achievements of others, until in October, 1846, a state of unconsciousness to pain was produced so effectually, and by an agent so reliable, that from that date artificial anæsthesia entered upon a scientific existence. The passage from this to obstetrical anæsthesia could be but a step. There had been in midwifery the same preceding effort, the same recognition of the great desirability of relieving suffering, which in all ages and among all peoples had challenged sympathy and had been recognized as one of the most striking features of humanity. In 1591 a poor woman was burnt in Edinburgh "for employing charms and other means to cast off the pains of labor."[1] Childbirth had been observed to go on with regularity and without suffering under certain pathological conditions of the nervous system. In a case reported by Ollivier the spinal cord was compressed by acephalocysts from the first to the fourth dorsal vertebra. In one observed by Hasse there had been a fracture of the fourth cervical vertebra. There was the case of Deneux, in which delivery took place during the unconsciousness of intoxication from alcoholic drink. Haller had made the statement, based upon the observations of Harvey, Lamotte, and Smellie, that uterine action would continue in a woman "ignara, stupida, et sopita, et immobilis, et apopleetica, et epileptica, convulsionibus agitata; et ad summum debilis."[2] Ramsbotham had made the observation that during the continuance of puerperal convulsions uterine action is *not* suspended, although no signs of pain are manifested by the woman.[1] The same facts awakened in Rush, of our own country, the spirit of prophecy. He "expressed a hope that a medicine would be discovered that should suspend sensibility altogether, and leave irritability or the powers of motion unimpaired, and thereby destroy labor-pains altogether." "I was encouraged to cherish this hope by having known delivery to take place in one instance during a paroxysm of epilepsy, and having heard of another during a fit of drunkenness in a woman attended by Dr. Church, in both of which there was neither consciousness nor recollection of pain."[2]

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[1] Simpson: *Med. Times and Gaz.*, April 4, 1868.

[2] Fredet: *De l'Emploi du Chloroforme dans les Accouchements simples, etc. etc.*, Paris. 1867; Simpson: *Applications of Anæsthesia in Midwifery.*

To Simpson of Edinburgh belongs the honor of having first induced unconsciousness by ether for the purpose of facilitating delivery. The woman's first labor had been terminated by craniotomy after a trial of the long forceps. In her second the head presented, but was high up and movable, and a pulsating loop of cord could be felt floating in the unruptured bag of waters. The pains not causing the head to engage in the pelvis, turning was decided upon; and for facilitating this operation ether was administered for a period of about twenty minutes, when the patient was rendered unconscious and version effected. Delivery of the head was very difficult, and an indentation of one parietal bone was produced by the projecting promontory of the sacrum. The child made a few respirations, but did not survive. The woman testified with wonder and gratitude to entire insensibility to pain during the whole process of delivery, and made a most satisfactory recovery, being up and dressed on the fifth day. This occurred on the 19th of January, 1847. The next case took place on the 3d of February following. It was again a second labor, the first having been instrumental. This time the forceps was applied and delivery effected during complete unconsciousness. Both mother and child were saved. A third case followed on the 12th of February. Ether was administered for the severity of the pains, and this came near being the first case of natural delivery under an anæsthetic, but finally the forceps was resorted to for termination of the labor.[3]

On the 10th of February, Prof. Simpson laid the subject before the Obstetrical Society of Edinburgh at some length, and presented the lessons derived from his experience in the following terms:

1. That the inhalation of ether procured for the patient a more or less perfect immunity from the conscious pain and suffering attendant upon labor.

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[1] *Obstetric Medicine*, 1844.

[2] *Medical Inquiries and Observations*, p. 376—quoted by Channing and alluded to by Simpson.

[3] Simpson: *Works*, "Anæsthesia," etc.

2. That it did not, however, diminish the strength or regularity of the contraction of the uterus.
3. That, on the other hand, it apparently (more especially when combined with ergot) sometimes increased them in severity and number.
4. That the contraction of the uterus after delivery seemed perfect and healthy when it was administered.
5. That the reflex assistant contractions of the abdominal muscles, etc. were apparently more easily called into action by artificial irritation and pressure on the vagina, etc. when the patient was in an etherized state.
6. That its employment might not only save the mother from mere pain in the last stage of labor, but might probably save her also, in some degree, from the occurrence and consequences of the nervous shock attendant upon delivery, and thereby reduce the danger and fatality of childbed; and,
7. Its exhibition did not seem to be injurious to the child.

The gist of the whole matter lies in the second paragraph. The step from surgical to obstetrical anæsthesia was but a short one, it is true, but it was over a chasm of unknown depth. Trial alone could show whether uterine contractions would continue, and thus labor go on, during the unconsciousness of ether. Simpson made the trial not only with boldness, but with that infinite tact which borders on genius. During the operation of turning it mattered little whether the uterus continued to contract or not, and he chose such a case for the first attempt. The fact of uterine contraction continuing during the influence of ether having been verified, obstetrical anæsthesia was established. Simpson himself recognized this as what it in truth is, "the one great fact upon which the whole practice of anaesthesia in midwifery is founded."

The recent warm reception and rapid advance of surgical anæsthesia facilitated the spread of the use of ether in obstetrics. In the course of a short time the new method was tested in the other capitals and cities of the British islands. On the 13th of February, Dr. Murphy of London resorted to it in a case of turning. Mr. Lloyd conducted a case of natural labor with ether on the 27th of March, and Dr. Protheroe Smith one on the 28th; the latter, with two other cases, was published in the *Lancet*, May 1st. Mr. Lansdowne of Bristol had a case on the 1st of April, and soon after reported several cases of the successful use of the new remedy. Dublin did not accept the innovation until a comparatively late period; the first case was one of instrumental labor, conducted by Dr. Tyler on the 28th of November.

In France etherization in childbirth was very early tried. Within a week of the first case at Edinburgh, Fournier-Deschamps delivered a patient under ether by the forceps, and on the 8th of February, Paul Dubois, then at the head of the Maternité of Paris, delivered another in the same manner. By the 23d of that month Dubois had had four other cases, and at that date he formally presented the subject to the French Academy of Medicine, with the following conclusions:

1. The inhalation of ether can annul the pain of obstetrical operations.
2. It can suspend the physiological pains of labor.
3. It destroys neither the uterine contractions nor the contractions of the abdominal muscles.
4. It diminishes the natural resistance of the perineum.
5. It does not appear to act unfavorably on the health or life of the infant.

Toward the end of the year Roux of Toulon published a paper upon the subject,[1] concluding as follows:

1. Ether does not interfere with labor by suppressing the pains.
2. In difficult labors it is desirable.
3. The uterine and abdominal muscles continue to contract under ether.
4. The child is not affected, nor is hemorrhage increased by it.
5. The secretion of milk or any other puerperal process is not interfered with.

Villeneuve of Marseilles and Stoltz of Strasburg published their observations and gave their testimony upon the subject. In Germany the first case occurred on the 24th of February, under the care of Martin of Jena. The ether was administered to facilitate separation and extraction of an adherent placenta. On the 8th of May, Siebold read a paper before the Royal Scientific Association of Göttingen. He had resorted to ether in eight cases, some of them instrumental and some natural. Deep narcotism seems to have been produced, the pains ceased, and this distinguished obstetrician ventured the prophecy that ether would find no favor in natural labor.[2] On the 3d of June, Grenser of Leipsic delivered a patient with the forceps under ether.

In our country the administration of ether in obstetrical practice was not resorted to as early as might have been expected, considering that it was the birthplace of artificial anæsthesia. The first administration took place on the 7th of April, 1847,[3] by which time Simpson had used it over fifty times.[4] It was a case of natural labor, under the care of Dr. N. C. Keep of Boston. The report concludes with the statement that "the result was highly satisfactory." Still, the labor was rapid, the patient was scarcely brought under the influence of the anæsthetic, and, although it is evident that her sufferings were mitigated, the testimony of the case could not have had much weight in favor of the new method. On the 6th of May ether was administered by Dr. Channing in a case of severe and protracted first labor, which was terminated by craniotomy after a trial with the forceps. The second case, on May 15th, was again a primipara, and the labor was terminated by the forceps.[1] It is to be inferred from Dr. Channing's book[2] that these two cases formed the subject of a pamphlet which was issued in May, and a second edition of which appeared in July, by which time he could report seven cases. These pamphlets were the first independent publications in this country upon this subject. Both the cases of Dr. Channing furnish the strongest possible evidence of the beneficial effects of ether during parturition, with entire absence of any untoward influence. Suffering was relieved, while uterine contractions continued; there was also associated expulsive effort, and in one case we have a graphic picture of the earnest demands of the patient for a further supply of the means of relief, which, in the beginning, she had refused to accept.

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[1] *Gaz. médicale*, Oct. 9; *London Med. Gaz.*, Oct. 15, 1847.

[2] *London Med. Gaz.*, iv. p. 1052.

[3] *Boston Med. and Surg. Journ.*, April 14, 1847.

[4] *Brit. and Foreign Med. Review*, April, 1846.

The first period in the history of obstetrical anæsthesia covers the discovery of the facts that uterine contractions would continue, while pain was abolished, and that no deleterious influence was exerted by ether, with the general acceptance of the method for preternatural labors and obstetrical operations. This period was cut short, as to ether, by the introduction of a new anæsthetic agent. Simpson was again the path-breaker. Moved, he tells us, from the first time that he saw ether inhaled, by the conviction that other agents would be found capable of entering the system by the pulmonary circulation and producing like effects, he entered upon a line of experiment and personal trial with various articles. Chloroform, which had been known for about fifteen years, but scarcely otherwise than as a chemical curiosity, was suggested to him by Mr. Waldie, a chemist, and a graphic account has been transmitted of the first trial of the inhalation of this agent by Simpson and his friends, Keith and Duncan.[3] They were immediately impressed with the conviction that they had found an anæsthetic superior to ether, and especially for obstetrical practice. Simpson had been impelled in his search by the manifest disadvantage of ether, especially by its disagreeable and persistent odor, its irritating effect upon the air-passages, and the large quantity required to produce anæsthesia. None of these objectionable features attached to chloroform. The quantity of the new agent required was small; drops took the place of drachms. Its action was more rapid, more complete, and more persistent. Its odor was pleasant, instead of unpleasant or even suffocative. In addition were to be considered a smaller expense and greater portability and the lack of need of special apparatus for administration. With these advantages in its favor there could be no question as to the relative position of the two agents. Chloroform rapidly displaced ether, and almost entirely superseded it.

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[1] *Boston Med. and Surg. Journ.*, May 19, 1847.

[2] *A Treatise on Etherization in Childbirth.* Illustrated by 581 cases. By Walter Channing, M. D., Professor of Midwifery and Medical Jurisprudence in the University at Cambridge: Boston, 1848.

[3] Miller: *Surgical Experiences of Chloroform*, Edinburgh, 1849.

No time was lost in making a trial of the new agent. Simpson had been in search of an anæsthetic especially for obstetric practice, and, emboldened by his large experience with ether, he administered chloroform for the first time in a case of labor and before it had been used for any capital surgical operation. It was a second confinement, the first delivery having been by craniotomy, and occurred on the 8th of November, 1847. After pains had lasted three hours and a half, and the os uteri was nearly dilated, the inhalation of chloroform was begun. The child was delivered in about twenty-five minutes, the mother being entirely unconscious and remaining so until after delivery of the placenta. Soon afterward Simpson again exhibited chloroform to a patient who in a former labor had had severe hemorrhage. She was kept under its influence sixty-five minutes, awoke unconscious of the birth of her child, and had no flooding. The third case was a primipara, twins. In all three cases the efficiency of the new agent in abolishing pain was exemplified and its rapidity of action shown, while no untoward circumstance occurred. During the same month the use of chloroform was extended to general surgery, and the news of its success in both departments rapidly spread to every part of the world, and everywhere its manifest advantages over ether were recognized. The first administration in this country for obstetrical purposes took place in the city of New York, by Dr. A. K. Gardner, as early as Feb. 2, 1848. It was a case of natural labor, and the same physician used it once more during the same month, and again in April for a similar case.[1]

The introduction of chloroform marks the second period in the history of obstetrical anæsthesia. Had it not been for the occurrence of deaths under this agent when given for surgical operations, it would doubtless have held the field alone. The fatal cases, however, surprised and shocked the profession, and exerted a powerful influence in preventing a resort to it or in causing a return to ether. But from this time on, both ether and chloroform were resorted to for obstetric purposes, and must be considered together. One was preferred by some, the other by others. This is no better exemplified than in Dr. Channing's book, which was published soon after the first deaths under chloroform had occurred. While he says that "from the evidence it would seem that chloroform has the advantage of sulphuric ether," and that his "latest experience with chloroform has been the most grateful," he admits that "patient and practitioner have felt the power of the untoward experience."[1] Notwithstanding the special title of his book, he took with him to his cases both chloroform and ether, and used either almost indifferently[2] or both in the same case. Of 516 cases of natural labor tabulated, 358 had ether and 158 chloroform. Moreover, he speaks of "*etherization* from chloroform,"[3] and of "the perfection of *etherization* which chloroform produces."[4]

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[1] *Bulletin N. Y. Acad. of Med.*, vol. i. p. 309.

The third period in the history of the subject comprises the further progress of the method, and especially the contest in regard to the application of anæsthetics to natural labor. The latter is a phase rather than a period, since no sharp line anywhere, at the beginning, separates the use of anæsthetics in natural from preternatural cases. Within three weeks after the first administration Simpson had given ether in "several cases of natural labor."[5] The first case in this country, as has been stated, was one of natural labor. Channing's third, fourth, seventh, eighth, and ninth cases were all natural labors, the first taking place on June 10th. But at first anæsthesia in obstetrics was chiefly resorted to for instrumental or preternatural cases. By the profession it was, for those cases, silently acquiesced in, if not accepted, and awakened no opposition because so similar to surgical anæsthesia, in which its advantages were manifest. With increasing experience, and with an agent more manageable and less unpleasant than ether, the advocates of obstetrical anæsthesia became more decided in their advocacy of the measure as a means of mitigating the pains of ordinary parturition. At once a storm of hostility was aroused, and a controversy awakened which has few equals in the annals of medicine. Medical journals were filled with articles, pamphlets were poured forth, and the debates of medical societies were occupied with arguments upon both sides of the question. It was again the old struggle of conservatism against the spirit of progress. Upon the one side were firm conviction of right and a noble impulse to benefit humanity; upon the other, caution, a wholesome fear of interference with a natural process, and a dread of resorting to so powerful agents unless life were endangered; upon both, without doubt, honesty and conscientious regard for duty.

To relate this contest in all its particulars would occupy far more space than is here at disposal. Only the leading features can be given, with the names of the chief actors. Opposed to anæsthesia in natural labor were Ramsbotham, Barnes, Lee, Montgomery, Ashwell, and Merriman in Great Britain; in Germany, Grenser, Siebold, Sachs, Scanzoni, and the professors of the Vienna School.[1] In this country Meigs, a forcible and elegant writer, occupying a chair in a leading medical college and in the profession a position of commanding influence, conducted the opposition. He entered the lists against Simpson himself, and proved one of the most influential opponents of the innovation. Hodge of Philadelphia and Bedford of New York supported Meigs. Both occupied chairs, both were authors of textbooks, and both enjoyed the respect of the profession. Although not so active in the controversy, they both threw their influence, which was great, against the administration of anæsthetics in natural labor.

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[1] *Op. cit.*, pp. 124, 125. See also "Report of Committee on Obstetrics," *Amer. Med. Assoc. Trans.*, vol. ii. p 247: "The unhappy result of the surgical use of chloroform has had a most decided influence upon its use in obstetrics"

[2] Pp. 94, 125. [3] P. 119. [4] P. 124. [5] *Anæsthesia*, Philadelphia, 1849, p. 133.

The arguments advanced against the new method were numerous, some of them theoretical and trivial, some of the gravest character. It was argued—

That the mother not having suffered in giving birth to her child, the maternal instinct would be lessened or abolished.

That the practice was immoral—1st, because etherization was similar to intoxication, and therefore was but drunkenness; 2d, as erotic manifestations sometimes occurred under anæsthetics, the lying-in room would be the scene of indecencies.

That it would cause in the patient various neuroses, as paralysis, epilepsy, and insanity, while attacks of convulsions, so often a complication of labor, were directly attributed to the drug, even when they came on several hours after the labor had terminated.[2]

That the pain of labor was physiological, and soon recovered from, conservative, and preservative in action. The total length of time of suffering, on the average, was carefully ciphered, and it was gravely argued that, after all, the lying-in room was, during most of the time, a scene of cheerfulness or even gayety.

That there had been an increase in the rate of mortality in the lying-in hospitals of Edinburgh and of Dublin since the introduction of anæsthesia.

That the procedure was not safe—1st, because of unknown idiosyncrasy on the part of the patient; 2d, because of unknown organic disease from which she might be suffering; 3d, because chloroform was cumulative in action; 4th, because there could be no reliance upon the constancy of the regular succession of portions of the nervous system as affected generally by the anæsthetic; 5th, because anæsthetics caused a status of the capillary circulation, and hence would follow dangerous or even fatal pulmonary congestion.

Finally, and more potent in influence probably than all the others, it was charged that anæsthesia was a sacrilegious attempt to set aside the decrees of Providence; that it was an impious interference with the awful majesty of divine justice, which had sentenced woman to suffer the pangs of childbirth; and that "it would rob God of the deep, earnest cries which arise in time of trouble for help."

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[1] Dutertre: *De l'Emploi du Chloroform dans les Accouchements naturels*, Paris, 1882.

[2] Ramsbotham: *Obstet. Med. and Surgery*, 5th ed. p. 178.

A plea may be entered now for those who conducted an opposition to a great improvement and a beneficent measure, which, since the measure has been established, seems, to say the least, short-sighted. Obstetric anæsthesia was an immense innovation, such an one as will never be seen again. It interfered with a natural process and did violence to long-cherished opinions. Generally, neither surgical nor obstetric anæsthesia was clearly understood at that time. In regard to the one the accepted doctrine was that the insensibility was effected by interference with oxygenation of the blood, and that etherization was asphyxiation. As to the other, the discoverer himself, as will be seen later, carried his patients, in ordinary cases, far deeper under the influence of the agent than is now consistent with the term; as a consequence of this, there was abolition or diminution of the pains and a confusing clashing of testimony.[1] Again, the brilliancy of the discovery led the injudicious into exaggerations, while the description of this new process by bystanders could scarcely fail to frighten those who were not present to witness its beneficent effects.[2]

The leaders of those who championed the cause of progress were equal to the occasion. Simpson was a man of great learning and varied information, while his high position, won by honest effort, gave weight to his opinions. Ingenious in argument, apt in illustration, practical in application, beyond question a lover of controversy, he conducted the campaign with a vigor, an energy, and a perseverance which excited the highest admiration. He brought up from history the opposition which had been made to other improvements in medicine, such as the circulation of the blood, vaccination, and the introduction of Peruvian bark. He collected statistics which showed the deleterious, the fatal effect of pain, *per se*, when long continued. He answered Meigs' plea of "physiological pain," and his description of the lying-in chamber as a scene of cheerfulness, not only with the graphic descriptions of the sufferings of parturition, as drawn by Velpeau and Naegele and Merriman, but with a quotation from Meigs' own writings, in which he stated the pain of childbirth to be simply "*agony*." He rallied philologists to his assistance as to the actual meaning of the words of the original curse; he showed that we interfered with the decrees of Providence in daily life, never more plainly than when the homely fanning-mill was used; and pushed the anæsthetic lesson of the deep sleep into which the Lord threw Adam for the removal of a rib.

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[1] "Etherization would seem to have as many sides as there are observers, and doctrines concerning it seem only limited by the number of observers."—CHANNING.

[2] "All the usual phenomena of the deepest sleep supervene almost suddenly, gliding often into the profoundest of sopor, if not absolutely lapsing into coma. The voluntary muscles become suddenly relaxed, the jaw falls, the arms hang down, the eyes roll upward under the upper lid, the respiration becomes slow and labored, and the face often either pale or morbidly flushed. The aspect of things is indeed such as can hardly be contemplated for the first time without alarm; the individual seems to the common eye to be sinking into the sleep of death."—SIR JOHN FORBES, *Brit. and For. Med.-Chir. Review*, April, 1847.

Among the earliest to appear in print in this country in favor of obstetric anæsthesia, after the reports of cases already mentioned, was Dr. Jonathan Clark of Merion, near Philadelphia. He published two articles upon the subject in the *Medical Examiner*,[1] containing a detailed report of 16 cases in which ether had been administered. "In most cases a perfect etherization destroyed the painfulness of labor even when the patient retained consciousness." There seemed to be no retardation of labor nor any unusual tendency to hemorrhage. The "trials of ether as a torture-saving agent were satisfactory to both physician and patients."

Dr. C. G. Putnam of Boston published a paper on "Etherization in Labor" on the 26th of January, 1848. It had been read on the 27th of December, 1847, and contained reports of 19 cases.[2] The same journal, of February, contained another article from the same writer which bore strong testimony to the safety and beneficial effects of etherization in labor.

A publication of great importance, and doubtless of very great influence, was the report of the Committee on Obstetrics of the American Medical Association, which held its first meeting in the city of Baltimore, May 2, 1848.[3] It is a well-written document, thoroughly scientific in spirit, and presents a careful analysis of the experience of others as well as that of the members of the committee. Without entering into the question of the mode of action of anæsthetics, and disposing of the religious objection to allaying the pains of labor in a short and common-sense manner, the two great questions of the subject are presented: Is the method efficient? Is it safe? The first required no answer. The second is considered at length and answered affirmatively. "The effects of these agents seem in some respects better adapted to the practice of midwifery than to general surgery." The sound advice is given that if the practitioner be timid he should give as small a quantity as twenty drops, and that in this dose "it may be pronounced in all cases safe." The statement is made that up to that time ether and chloroform had been given in about 2000 cases without a death or any deleterious consequences. The benefits of these agents are stated to be relief of pain and allaying of nervous symptoms, and the effect may be kept up for hours with entire safety, together with relaxation of the soft parts and increased secretion of mucus, whereby labor is promoted. "The parturient pains have not been diminished either in force or frequency; relaxation has been promoted; pain and suffering are lessened or entirely annulled; the placenta readily thrown off; and all the circumstances following the birth of the most favorable character." While believing that the majority of natural labors do not need these agents, their use is assented to in any at the last and most painful stage. The paper closes with full directions for the administration of chloroform.

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[1] Vol. iii., 1847, p. 589; vol. iv., 1848, p. 153. It has been impossible to obtain *dates* of the appearance of several of the earlier papers.

[2] *Boston Med. and Surg. Journal.*

[3] *Transactions*, vol. i. The report is signed by Harvy Lindsly, George C. M. Roberts, Joshua Riley, C. R. Gilman.

In an appendix to this report are given a few communications from leading physicians. Dr. Channing reports his use of anæsthetics in about 40 cases of natural and other labors up to December 16, 1847. Dr. J. C. Bennett of Plymouth, Mass., has used chloroform in nearly 200 cases "without the least evil result" and with very much benefit. Dr. M. B. Wright of Ohio reports "a considerable number of cases," presumably natural labor. He impresses the value of "a gradual rather than a sudden impression," and believes that, "cautiously employed, the agents under consideration will prove of more value to the human family than any medicinal agent yet discovered."

In the autumn of 1848 the work of Dr. Channing appeared. It is a noteworthy book, from the importance of its subject, from its high character and valuable contents, and from the fact that it is the only work devoted exclusively to the subject in our language. It at once placed its author in a position similar to that held by Simpson in Great Britain; he was recognized as the leader of the great progress. He was worthy of the position and the occasion. Learned, dignified, and endowed with talents, occupying a prominent position as a teacher of obstetrics, he enjoyed the respect and the confidence of the profession in a high degree. Less versatile and less brilliant than the great Edinburgh professor, the service he rendered to the cause was at once effective, solid, and enduring. That service was his book. It is honest, scientific, and convincing. Its keynote is that anæsthesia in labor is *safe*, and the whole question is hinged upon this point alone. It shows the most conscientious study of the subject; honesty of purpose is apparent on every page, while the spirit of partisanship nowhere appears; and it is pervaded with the nobility of the mission of giving relief to suffering humanity. Its report of 516 cases of natural labor, in 158 of which chloroform, and in 358 ether, had been administered, with 52 cases of instrumental or complicated labor, was a solid contribution of facts to the subject never before or since equalled. Its presentation of these facts, its collection of correspondence from other medical men, its clear and dignified argument, could not fail to carry conviction wherever conviction was possible. The work exercised a powerful influence in directing the current of professional opinion, and will always stand among the highest in American obstetrical literature.

Dr. Channing's volume shows that he was supported by about twenty physicians of Boston and neighboring towns, whose experience is given in an appendix. Among those reporting the largest number of cases previous to the middle of the year 1848, and who resorted to anæsthesia in natural labor, were Dr. John Bigelow, 10 cases; Dr. A. R. Thompson, 15 cases; Dr. John Homans, 56 cases; Dr. Simon Packer, 22 cases; Dr. John Jeffries, 10 cases; and Dr. A. Phelps, 27 cases.

Prof. Lindsly of Washington, D. C., also appears as a warm advocate of the safety and benefit of anæsthesia in labor.

The next contributor to the subject was Dr. George N. Burwell of Buffalo. He published very early a "Statement of Fifteen Cases of Labor in which Chloroform was Administered."[1] This paper was followed by several others at intervals, until finally his experience was presented to the Medical Society of the State of New York at the meeting of 1853.[2] This is a most important contribution to the subject. It contains the writer's experience during the preceding five years. In it are presented the results and teachings of 180 cases of labor in which he had administered chloroform. The circumstances and symptoms are carefully noted, the cases are classified and compared, and the patients are even followed up, as far as possible, in regard to after-effects. In all respects it is a work of high character, fully commensurate with the importance of the subject studied, and is, moreover, strikingly original. The observations are all his own. No authorities are quoted, borrowed from, or referred to. Simpson's name is once mentioned, and then only to dissent from his doctrine.

In the West obstetric anæsthesia found a warm advocate in Prof. Henry Miller of Louisville. Occupying a chair in the University and author of an excellent textbook on obstetrics, his testimony in its favor was as influential as it was enthusiastic. The first case of administration of chloroform in labor west of the Alleghanies was in his hands. It was a forceps case, and occurred in February, 1848. The anæsthetic was given for four or five hours before resorting to the instrument. In his book he makes a full, clear, and strong reply to each of the objections urged by Meigs against the practice, enters a powerful plea for the amelioration of the sufferings of women in labor, and renders his testimony, based upon experience, as to the entire safety of the method. Chloroform is "really the safest and most manageable of all the agents at our disposal endued with equal potency." "If it be not urged beyond the degree necessary to annul pain and tranquillize the patient, there is positively no risk whatever in its administration."[1]

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[1] *Buffalo Med. Journ.*, 1848–49, iv, p. 331.

[2] "On the Use of Chloroform in Midwifery," by George N. Burwell, M. D., one of the physicians of the Buffalo Hospital. Issued also as a pamphlet.

In what can be but a sketch of the progress of events it is obviously impossible to mention every one connected with it, much less to make statement of their work.[2] A few names, however, demand exception from their high character, commanding position, the extent to which they enjoyed the confidence of the profession, and the power and persistence with which they urged the claims of obstetric anæsthesia. Dr. Fordyce Barker of New York is one of these. He read a paper before the Academy of Medicine in 1857, which was published in pamphlet form, and another before the same body in 1861.[3] In these he strongly advocated the use of chloroform in labor, examined the indications for, and the objections to, its use, urged its value in natural labor, and expressed the strongest convictions of its safety. He has since published several papers in journals upon the subject, and has continued to advocate anæsthesia, presenting the results of the practice from his large experience down to almost the present date.[4]

Dr. Barker was ably seconded by Dr. George T. Elliot. Occupying the chair of Obstetrics in a leading medical school, endowed with high abilities as a writer and speaker, his influence was of great weight. Moreover, he could testify from an experience rarely equalled. He had been one of the first to avail himself of the anæsthetic powers of chloroform, and had taken it thirty or forty times. He had witnessed its administration by Simpson during some months, and at the Dublin Lying-in Hospital in over a thousand deliveries, and had had an experience with it of nine years in the lying-in hospitals and wards of New York. The testimony of Dr. Elliot, based upon large experience and observation both in private and hospital practice, was of the strongest character as to the benefits of chloroform in labor and as to its safety when properly administered.[1]

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[1] *Principles and Practice of Obstetrics*, Philadelphia, 1858, p. 461.

[2] The following titles of papers which appeared during the first decade of obstetrical anæsthesia are taken from the Catalogue of the U. S. Army Medical Library:

Beech: "Use of Anæsthetics in Rigidity of Perineum in First Labors," *Buffalo Med. Journ.*, 1853–54.

Boerstler: "On the Use of Letheon and Chloroform in Obstetrics," *Proceedings Med. Convention of Ohio*, 1849.

Boling: "On the Use of Anæsthetic Agents, more especially in Parturition," *New Orleans Med. and Surg. Journ.*, 1851–52.

Cook: "Anæsthetization, its Parturient Agency," *Transylvania Med. Journ.*, 1852–53.

Graham: "Chloroformization in Midwifery," *Nashville Journ. Med. and Surg.*, 1856.

Haskins: "Anæsthesia in Natural Labor," *Western Journ. Med. and Surg.*, Louisville, 1850.

Kerr: "Chloroform in Labor," *Western Med.-Chir. Journ.*, 1850.

McLean: "Anæsthesia in Midwifery, with Cases," *New Orleans Med. and Surg. Journ.*, 1850.

Miller, H.: "Report of the Committee on Obstetrics," *Trans. Kentucky Med. Soc.*, 1852–53.

Robertson: "Successful Employment of Chloroform during Labor," *South. Med. and Surg. Journ.*, Augusta, 1848.

Smith, O.: "Anæsthesia in Parturition," *South. Journ. Med. and Phys. Sciences*, Knoxville, 1857.

Stevens: "Chloroform in Natural Labor," *N. Y. Journ. Med.*, 1849.

Knight: "Use and Effects of Chloroform in Labor," *West. Journ. Med. and Surg.*, Louisville, 1855.

The following deserves mention as the prize essay of a State society. It is physiological, experimental, and largely taken up with citation of authorities. The author's experience extended to but 16 cases:

Culbertson: "The Use of Anæsthetics in Obstetrics," *Trans. Ohio State Med. Soc.*, 1862.

[3] *Bulletin N. Y. Academy of Med.*, vol. i., 1861–62, p. 287.

[4] *Philadelphia Medical News*, Feb. 12, 1887.

Dr. Lunsford P. Yandell of Louisville was an able and energetic advocate of chloroform in obstetrics. He presented a plea for it to the State Medical Society of Indiana in 1871, and another to the Kentucky State Medical Society in 1877. In 1870 he made a powerful plea for its safety in the *American Practitioner*, and again advocated its claims in 1878 in the *Louisville Medical News*.

In Great Britain the introduction of obstetric anæsthesia found able advocates. Among the supporters of Simpson were Protheroe Smith, Murphy, Rigby, Snow, Sinclair, Denham, Landsdowne, Beatty, and Carmichael. The first-named, besides the early publication of papers[2] and reports of cases both instrumental and natural, issued a pamphlet on "Scriptural Authority for the Mitigation of the Pains of Labor."[3] Denham presented his experience with chloroform,[4] and replied to Greame's pamphlet[5] on the "Misapplication of Anæsthetics in Childbirth, exemplified by Facts." He showed that the fatal cases adduced could not be justly attributed to the chloroform, and he might have added that in Greame's cases the anæsthesia was in all carried far too deeply. Dr. Carmichael successfully answered an attempt to show that the childbed mortality of Edinburgh had increased since anæsthetics had been introduced:[6] the figures would not bear scrutiny. Sinclair did the same later in regard to the Dublin Lying-in Hospital.[7] He presented his experience with Dr. George Johnston, and proved that the death-rate had not been increased, disease induced, or convalescence prolonged. Landsdowne was "better pleased with the application of anæsthetics to natural labor than to any other cases."[8] Dr. Edward W. Murphy, who occupied the chair of Obstetrics at University College

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[1] *Bull. N. Y. Acad. of Med.*, vol. i.

[2] *London Lancet*, May, 1847.

[3] London, 1848.

[4] "Report on the Use of Chloroform in Fifty-six Cases of Labor at Dublin Lying-in Hospital," *Dublin Quarterly Journal*, Aug., 1849.

[5] London, 1849.

[6] *London Med. Gaz.*, 1850, p. 80.

[7] *Dublin Quarterly Journal*, 1864.

[8] *London Lancet*, May 29, 1847.

Hospital, published a pamphlet of twenty-eight pages,[1] which, based upon personal experience, was a powerful plea in favor of anæsthesia. Beatty of Dublin did good service, not only by the publication of papers,[2] but by his answer to Lee's attack.[3] In December, 1853, Dr. Robert Lee read a paper before the Royal Medico-Chirurgical Society purporting to be a report of 17 cases of labor in which chloroform had been inhaled with most pernicious effects.[4] The paper was written in a spirit of bitter partisanship, and contained evident exaggerations, even personal denunciations and disgraceful charges against the supporters of anæsthesia. In a scientific light it would not bear examination; the cases were merely stated, not detailed as to time, place, and particulars. Rigby and Snow addressed frequent articles to the profession. The publication of the treatise of the latter in 1857 came at about the close of the contest, and added a classical work to the literature of the subject.

In the month of April, 1853, an event occurred which exerted a greater influence upon the progress of obstetric anæsthesia in Great Britain than all the efforts of scientific men. It was the acceptance of the method by the queen. In her seventh labor, when Prince Leopold was born, chloroform was administered to her by Snow. Nothing could exceed the astonishment with which the announcement was received, and the tone of the leading medical journals showed but too plainly what would have been the sentence passed upon Her Majesty's attendants, Locock, Grant, and Ferguson, and the administrator, had anything untoward occurred. There is not one word of congratulation for either medical men, the royal patient, or for humanity. "In no case could it be justifiable to administer chloroform in a perfectly ordinary labor," said the *Lancet*.[5] Doubtless all concerned felt the "awful responsibility" of the undertaking, but, having been successful, it had the immense influence upon the people always exerted by royalty. The practice rapidly spread, especially among the aristocracy, and the illustrious sovereign whose reign has seen so many notable achievements may congratulate herself upon a personal participation in the greatest one of the age, or of any age, so far as the suffering of her sex is concerned. In all time to come for this service homage is due to her as the woman rather than as the queen.

Obstetrical anæsthesia did not receive a warm welcome in France. The contest in regard to it has been bitter and prolonged, and presents some special features which deserve attention. Indeed, it has not yet terminated, and within even a few years a controversy which closed in Great Britain a quarter of a century ago has been carried on with warmth and violence, and to-day the majority of her leading authorities do not accept the method. By the testimony of her own writers France has always been slow to accept improvements originating in other countries. Premature artificial delivery did not obtain a foothold until sixty years after it was established in other countries, and then only in the face of violent opposition.[1] Surgical anæsthesia was not resorted to for severe operations in provincial towns at a period twenty years after its discovery.[2] The non-acceptance of anæsthetics in natural labor might seem strange after the very favorable report of their action which was presented by Dubois to the Academy of Medicine so early as February, 1847. But Dubois appended to this report an opinion that they should not be generally resorted to in labor; which drew from Malgaigne the severe but just remark that an immense chasm separated the practical from the scientific conclusions of the distinguished obstetrician. Dubois then stood at the head of obstetrics in France. He was intellectual, sagacious, prudent, but a temporizer and timid. Two of the fifteen patients anæsthetized by him died of puerperal fever, and to this has been attributed his bias against the measure. Much more probable, however, is Pajot's explanation, who refers it to a surgical case, removal of mammary gland, in which dangerous symptoms from chloroform were manifested. However, the sentence was promulgated, obstetrical anæsthesia disappeared in France, and remained almost entirely ignored for many years.[3] For this result Dubois was mostly responsible, although Buisson, in a pioneer work of great value,[4] helped to perpetuate it by his adverse opinion as to anæsthesia in natural labor.

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[1] *On Chloroform in the Practice of Midwifery*, London, 1848.

[2] *Dublin Quar. Journ.*, Aug. 1, 1850.

[3] *Contributions to Medicine and Midwifery*, Dublin, 1866.

[4] *Amer. Journ. Med. Sci.*, Jan., 1855.

[5] May 14, 1853.

The subject was brought forward again in 1854 by Houzelot, who read a paper, based upon 20 cases, before the Société de Chirurgie, published also in pamphlet form.[5] The paper was referred to Laborie, and a warm debate took place upon his report, which closed, however, with its adoption. One of the terms of the report was that "the administration of chloroform in simple labors is considered good." In 1857 appeared the important thesis of Blot.[6] It admitted the abolition of the painful element of labor by anæsthetics without interference with uterine or muscular contractions, the diminution of the perineal resistance, and an entire harmlessness for both mother and child. Nevertheless, the author rejected their use in natural labor. So also did Stoltz in his article on "Accouchements" in the *Nouveau Dictionnaire pra-*

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[1] Joulin: *Traité des Accouchements*, 1866, p. 644.

[2] Dutertre: *De l'Emploi du Chloroforme dans les Accouchements naturels*, Paris, 1882, p. 16.

[3] Dutertre: *op. cit.*

[4] *Methode anæsthésique*, 1850.

[5] *Mémoires de la Société de Chirurgie*, 1853-54.

[6] *De l'Anesthésie appliqué à l'Art des Accouchements.*

tique.[1] The powerful influence of the classic work of Maurice Perrin was also adverse,[2] although the arguments are entirely theoretical, the admission made of an entire lack of instances of injurious effect, and the judgment evidently rendered upon a fear of what might possibly come to pass.

Anæsthesia had also to meet the opposition of two teachers, pupils and successors of Dubois, and who succeeded to his position in obstetries in France—Depaul and Pajot. The former, while fully admitting the immense advantages to be derived from anæsthesia in operations and obstetrical manœuvres, rejected it in natural labors—

"1. Because the employment of anæsthetics, whatever may be said to the contrary, is not without danger, and the woman may be killed.

"2. Because the anæsthetic sleep, in depriving her of reason, does not permit her participation, to an extent almost always necessary, in the great act which she accomplishes.

"3. Because the danger which I have stated is not compensated for by the advantage which results from the diminution or suppression of pain."[3]

The first count of this indictment is supported by the grave charge that the advocates of anæsthesia suppress fatal cases, and by the statement that he knows of two deaths in Paris. The latter statement has the usual fatal weakness of omitting time, place, and circumstances. In the heat of his opposition Depaul took up two positions, both of which are entirely untenable, both as singular as they are false. The first is, that there is no such thing as relief of pain short of surgical anæsthesia; "there is no such thing as demi-anæsthesia." The second is, that all relief experienced by the woman is imaginary. "You sacrifice to the exaggerated pusillanimity of a woman, who, ignorant most generally of the real pain of labor, believes herself [*se figure*] to have suffered much less than if chloroform had not been administered." "The chloroformists simulate an anæsthesia which they do not produce, and address themselves more to the imagination of the woman than to her physical sensibility."

Pajot is the author of the article "Anæsthésie obstétricale" in the *Dictionnaire encyclopédique des Sciences médicales*[4]—a fact which indicates at once his position and his influence. While accepting anæsthesia fully for all obstetrical operations, he will only admit of it in a labor terminated by the natural powers under certain conditions—"perhaps toward the termination of expulsion, in some exceptional cases of women completely unreasonable, deaf to all exhortation, who make efforts to get up, uttering horrible cries, and threatening danger to the infant." But in a paper of controversial character published in the

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[1] T. i., 1864.

[2] *Traité d'Anæsthésie chirurgicale*, 1863.

[3] *Leçons de Clinique obstétricale*, Paris, 1872.

[4] T. iv., 1876.

Annales de Gynécologie and also in pamphlet form[1] the opposition of Pajot to this method is more pronounced and his spirit of partisanship is fully revealed. He is bitter, sarcastic, and denunciatory. For him also there is no such thing as "demi-anæsthesia;" it is all surgical anæsthesia or nothing. The patient is either imposed upon or deceives herself, or she is rendered insensible, motionless, and speechless. The "*pretended*" demi-anæsthesia is likened to medals and blessed waters, and termed "anæsthesia of the thirtieth dilution;" it is an error which he will expose as one of the errors "of Simpson, an *esprit* more brilliant than judicious."

"The employment of chloroform in natural labor has the chances of surviving a long time with the women and their attendants, who, thanks to the equivocation and their ignorance, confound *l'anæsthésie à la reine* with true anæsthesia. The irresistible illusion of the 'without pain' will not disappear even before the reality. Women will be made to believe that they would have suffered much more without demi-anæsthesia. Chloroform is, for the accouchées, what Providence is for him who has broken a leg; it is to be thanked, for he might have broken two."

This paper of Pajot's was a reply to two articles in favor of anæsthesia in natural labor published in the *Journal de Thérapeutique* in 1874. They were by Charles James Campbell, an Englishman educated and domiciled in France. He had been the *chef de clinique* of Dubois for two years. He was the leader of the Anglo-American colony in Paris, in which obstetrical anæsthesia was preserved from utter extinction.[2] "Learned, skilful, of good presence and charming manners, he enjoyed the favor of the court of the Second Empire, while his success in practice and his skilfulness as an obstetrician were bywords in Paris."[3] He had introduced anæsthesia into his practice at an early period, having published a paper upon it in 1849: this amelioration of the sufferings of labor had brought him crowds of wealthy patients and placed him in the front rank of obstetricians in the French capital—facts which were not likely to make his methods acceptable to rivals or to soften a controversy concerning them. At the International Congress held at Geneva in 1877, Campbell presented a memoir,[4] the first part of a work which was to be a complete treatise upon obstetrical anæsthesia. It is somewhat prolix — necessarily, perhaps, because largely controversial—yet it is clear, forcible, and convincing, a powerful plea for the relief of suffering of the sex. It is largely occupied with the proof of "demi-anæsthesia"—that there was a stage of insensibility to pain without loss of consciousness, denied by Depaul and Pajot. And most singular it is that labored argument should need to be addressed to eminent and practical men to convince them of a fact which a few observations in the lying-in room, or, better still, a single personal trial when suffering from pain, would have placed beyond doubt. To theoretical objections Campbell could oppose facts. In his book he presented the results of his practice—chloroform administered in more than a thousand labors, and without danger, without any unpleasant effects, and with the immense advantage of a notable diminution of suffering. This and much of practical character in the book made it, like Channing's work, a most valuable contribution to the subject and ensured a weighty influence. Death removed the author before the work could be completed, but his name deserves a place, as a promoter of obstetric anæsthesia, only below that occupied by the names of Simpson and Channing.

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[1] *Le Chloroforme dans les Accouchements naturels*, par le Professeur Pajot, 1875.

[2] Dutertre: *op. cit.*

[3] "Obituary Notice," by Playfair, *Obstet. Journ. Great Brit. and Ireland*, 1880, February.

[4] *Considérations nouvelles sur l'Anæsthésie obstétricale*, Paris, 1877.

The controversy was continued by numerous able writers. Pichaud supported Campbell at the Geneva Congress. Hervieux, although conservative, expressed the opinion that "if we had not chloroform we would be obliged to invent it," and says that "the sum of its advantages far outnumbers its dangers."[1] Courty threw his great influence in favor of anæsthesia in natural labor, giving his experience with 40 cases which had been "most satisfactory in every respect."[2] Dumontpallier read a paper before the Société médicale des Hôpitaux in which he clearly recognizes true obstetrical anæsthesia, and declares it to be "never a danger," making a strong plea for a more general resort to it. The debate which followed in the Hospital Medical Society was generally favorable to the method. Lataud boldly claims that "no authentic fact exists which could cause us to doubt the immunity of obstetric chloroformization."[3] Upon the other side appeared Pinard with a thesis based upon 23 cases, in which he denies demi-anæsthesia and rejects chloroform in natural labor.[4] It is conceded to be a work of high value based upon clinical research, although the number of observations is limited.

After this long controversy and presentation of observations the administration of anæsthetics in natural labor is not established in France. It is to-day condemned by the teaching officials of the country.[5] Of the later textbooks, Joulin alone accepts and recommends the measure,[6] beliving that "the rejection of chloroform in natural labor by the majority of French authors does not rest upon any practical and

[1] *L'Union médicale*, Aug., 1878.

[2] *Gaz. hebd.*, Oct., Nov., 1878.

[3] *Gaz. hebd. de Méd. et de Chir.*, Jan., 1879.

[4] *De l'Action comparée du Chloroforme, du Chloral, et de la Morphine chez la Femme en Travail*, 1878.

[5] Dutertre: *op. cit.*

[6] *Traité des Accouchements*, Paris, 1866.

serious basis." Cazeaux[1] follows the majority in restricting anæsthetics to the operations of obstetrics. His objections, besides that of possible danger, are but poetical rhapsodies. Possibly, the patient should be consulted as to whether she would rather be spared agony or have "her imagination clear to revel in the approaching joys of maternity" or to experience the "ineffable joy at hearing the first cry of the newborn." Charpentier, in his late encyclopædic work,[2] cannot quite accept Pajot's and Depaul's doctrines, and seems disposed to gratify a suffering woman even if the effect be only imaginary. He does not recommend obstetric anæsthesia, and he "does not believe that he is authorized to reject it in labors even the most natural."

The use of anæsthetics in obstetrics has been as carefully and as thoroughly studied in Germany as in any other country of the world. Their physiological action has been especially investigated by Kiwisch, Martin, Schroeder, Spiegelberg, and Braun. The original papers and works not being accessible, it is impossible to give the share which each took in the advance. In the leading textbooks of that country anæsthesia is advised for all operations and under special circumstances, but generally rejected for natural labor. This is the doctrine of Naegele (1867), and it remains unchanged in the French translation by Aubenas (1880). Spiegelberg (1878) teaches the same. So does Zweifel (1887) in the latest textbook upon the subject. Schroeder, in his *Handbuch* (1871) says there is no reason why the physician should not exercise his most pleasing calling of relieving pain, and that the degree of narcotism necessary for relief is absolutely without danger.

It has been shown that the use of anæsthetics in natural labor was accepted in English-speaking countries at an earlier period and more readily than in other parts of the world. Just when acceptance of the practice became general it is impossible to say, for no single event marks it. The contest lasted something more than a decade after the discovery. Numerous influences concurred to produce the final result. Another confinement of Queen Victoria occurred in 1857, and again exerted a powerful influence with the laity. The publication of an able article addressed to this class in the *Westminster Review* for January, 1859, doubtless had a great effect. Snow's classic work appeared in 1858, and aided much in placing the method upon a scientific basis and promoting its acceptance by the profession. So also did the report of the Chloroform Committee of the Royal Medico-Chirurgical Society,[3] in which the matter was no longer questioned, but treated as settled. Formal opposition may be said to have ceased with the appearance of the fifth edition of Ramsbotham's work on *Obstetrics* in 1867. In this are reprinted all the objections and arguments of the preceding edition, occupying more than thirty pages, and then the whole is retracted. The retraction is made but grudgingly, it is true, yet it is made.

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[1] *Traité des Accouchements*, 9th ed., by Tarnier, 1877.

[2] *Traité pratique des Accouchements*, t. i., Paris, 1883.

[3] *Med. Times and Gaz.*, 1864, ii. p. 76.

In this country the contest ceased with the passage of the original opponents from the stage of life. No new ones arose, and anæsthesia in natural labor is everywhere theoretically accepted. Yet it did not spread with that rapidity, nor is it at this time so generally accepted, as might have been expected in the country which gave birth to anæsthesia, and which has furnished so much and so strong evidence in favor of its application to obstetrics. Channing complained of the apathy of the profession in regard to it; a year after the discovery the number of cases which, with industry, he could collect did not much exceed five hundred. Miller says the practice rather crept than flew over the country. And now, it is believed, there is not such a general resort to anæsthetics in natural labor as so great a boon to suffering woman deserves or as is consistent with the second great object of the profession —the relief of pain. This certainly is not the effect of any records of accident or disaster in obstetrics, for such do not exist. The result must rather be attributed to the bad name which chloroform has acquired in surgical practice, and a prejudice against it resulting therefrom. A good deal, too, must be attributed to the very strong conservatism manifested by some of our leading teachers, and still more, perhaps, to a lack on the part of the profession of that careful study which so important a subject demands. "Few practitioners give themselves the trouble to master the necessary *modus operandi* of the use of anæsthetics, to study the limitations of their usefulness, or to learn the conditions of their safe administration."[1] The general neglect of the method is to be deplored alike in the interests of the profession and of humanity.

OBSTETRICAL ANÆSTHESIA.

General anæsthetics are administered in labor in two distinct classes of cases:

1. In obstetrical operations and painful manœuvres;
2. In normal labor to mitigate or annul pain.

In the first class of cases the administration differs in no essential point from that of surgery. More important in obstetrics because two lives are at stake, deep anæsthesia is the same in the one as in the other, and but a few points require special consideration.

In the second class, however, the process is a special one and demands careful study. The object here is to alleviate or annul suffering without abolition of consciousness; the sensations of the patient are to be kept in abeyance, while her relations with the external world remain but little disturbed.

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[1] Lusk's *Obstetrics*, 1886.

As this result is attained at a certain portion of a process, a farther stage of which is the condition of deep narcosis required for surgical operations, it is unfortunate that we have no other word in our language to designate it than the one used for the full effect—"anæsthesia." Simpson recognized this fault in our language, and expresses regret that he did not adopt the word "nodynia" (*νοδυνια*). The term "demi-anæsthesia" was applied to the condition in France, but has not been adopted. "Analgesia" is the best word we have, and this and the term "obstetric anæsthesia" will be used here to designate that part of the anæsthetic process in which pain is relieved or abolished while consciousness remains.

The physiological basis of obstetric anæsthesia is the fact that the action of anæsthetics is regularly progressive, affecting first the lower portions of the nervous system, and ascending gradually to the higher. Experimental proof of this was furnished by Flourens and Longet as early as 1847, and repeated by Bernard.[1] First, the lower part of the spinal cord is affected, then the dorsal and cervical portions, finally the medulla oblongata. The intellectual processes are early disturbed, then comes loss of perception of external impressions, as of touch and the special senses, then entire loss of consciousness, while sensibility to internal impressions remains, and reflex actions arising from them are only abolished later. In labor the contractions of the uterus continue after consciousness is lost; they will be excited to increased energy upon passing the hand into the organ even in a condition of deep narcosis. At a more advanced period this internal or unconscious sensibility, if the term may be used, is also abolished, the reflex actions dependent upon the medulla oblongata (respiration and circulation) cease, and life is extinguished.

All writers upon anæsthetics have based upon this progressive action of the agents a division of their effects into stages. The number of these stages has varied very much with writers. The important fact is, however, that the process is a continuous one, and that no arbitrary lines separate different portions of it; they glide imperceptibly into each other. Personal experience can alone give a clear understanding of the gradually progressive action of anæsthetics, and personal experience *during pain*. Based upon such experience, issue is taken with all those who place disturbance of the intellectual processes or interference with consciousness among the first effects of the inhalation of chloroform. *Relief of pain* precedes everything else, except a glow of stimulation and a sense of fulness in the head. The fact is important in its bearings upon the subject under consideration, and error as to the succession of events has had its origin in two sources—inhaling the anæsthetic when free from pain, and inhaling it too rapidly. Those who would test the matter should do it when suffering, and use very small doses, inhaling slowly.

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[1] *Leçons sur les Anæsthétiques et sur l'Asphyxie*, Paris, 1875.

Obstetrical and surgical anæsthesia are, then, although parts of the same process, very different in many respects. The one lies between loss of consciousness and that deep narcotism which is dangerous; the other stops before consciousness is entirely abolished; the one is a fixed condition attained directly and maintained constantly; the chief characteristic of the other is its mobility—it varies with almost every act of respiration. During different stages of the same labor it is frequently necessary to pass from one to the other, carrying the patient deeper under the anæsthetic as the pain augments; and this is easily done, while to hold her, during a considerable period of time, in the condition of analgesia is a difficult and delicate task, requiring the closest watchfulness and constant attention.

DIFFERENT ANÆSTHETICS.

The superiority of chloroform over ether for the production and maintenance of obstetric anæsthesia is manifest. The historical sketch has shown that the advantages of small quantity, rapidity of action, and pleasantness immediately carried the suffrages of the world in favor of chloroform against an agent which produces a marked period of excitement, which is unpleasant to inhale, and which requires for administration a special apparatus, or, in default of one, loads the atmosphere of the apartment with its vapor. Moreover, this vapor is highly inflammable, and the danger of accident from its ignition was recognized by Channing. Since it will take fire at a distance of fifteen feet,[1] it is a fact which demands serious consideration. Chloroform has one quality which peculiarly fits it for the purposes of the obstetrician —its *manageability*. This is, of course, dependent upon its power. Speaking from personal experience, during inhalation the effect of a single inspiration can be plainly distinguished, and the importance of the fact in a process where frequent recurring and intermittent pain is to be met is apparent.

Ether can receive consideration as an anæsthetic in obstetrics only on the ground that it is "the safer anæsthetic." Such a statement has been made.[2] But if this statement be founded upon surgical practice, it has no statistical basis. Theoretically, ether is the safer anæsthetic, and on that ground it is preferred by the majority of surgeons in this country, while it is gaining ground in Great Britain. Yet its superior safety is not sufficiently apparent to induce the surgeons of France, Germany, or Italy to adopt it. In those countries, with their immense surgical practice, chloroform is almost universally the anæsthetic.[1] And those who have carefully studied the subject are firmly convinced that if the mortality of each agent, with the number of administrations, were accurately known, there would be but little difference. "The difference between the mortality of chloroform and that of ether is far from being as great as has been attempted to be shown. . . . . My conclusion is: chloroform is not as fatal, nor ether as innocent, as they have been represented."[2]

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[1] Squibb: *Ephemeris Mat. Med.*

[2] Parvin: *Science and Art of Obstetrics*, 1886.

In some parts of this country, however, ether is used almost exclusively in obstetrics. This is the case in Boston and probably throughout New England.[3] It is also the case in Philadelphia.[4] The choice cannot be made upon any superior advantages of ether in obstetrics, for none such have been laid before the profession. The lamented George T. Elliot made a comparative study of the two anæsthetics, and found no difference in their effect upon the labor-pains. Stoppage or diminution of their force, "which demands that chloroform should be occasionally denied to a patient, is produced as readily by ether."[5] It is also a notable fact that at a meeting of a leading medical society held in the city of Boston a strong paper was read upon the possible danger of chloroform in obstetrics, yet it elicited not a word in presentation of the superiority of ether.[6] But one recent textbook of obstetrics distinctly recommends ether to the rejection of chloroform.[7] Wherever ether is used instead of chloroform, it is on account of a belief in its greater safety which is not founded upon facts, or in deference to a prejudice which exists in the public mind against chloroform in many parts of the country.[8] This prejudice on the part of the laity is but a reflex from the professional mind; it is not warranted by the facts, but, like all prejudices, is mostly the result of ignorance.

In surgery an attempt has been made to avoid the dangers of chloroform and the disadvantages of ether by using them together, or by a combination of the two with alcohol. This plan has been pursued to a limited extent in obstetrics. It was made the subject of a special treatise by Dr. Ellis,[1] but, unfortunately, his plan required a complicated and expensive apparatus, and, although his little work is of high scientific character, it has had but moderate influence. A strong plea for the mixed vapors was made by Dr. Sansom before the London Obstetrical Society.[2] He advises the use of a mixture of one part of chloroform to two of absolute alcohol. The alcohol in all these mixtures acts not only as a diluting agent, but "by restraining volatilization favors admixture with air." Dr. Edis states that he has been long in the habit of using a mixture of equal parts of chloroform and ether, and "believes the tendency to hemorrhage to be less than with chloroform alone."[3] Dr. Isaac Brown wrote in favor of chloroform two parts, alcohol one part, with the addition of cologne.[4] Dr. Playfair says: "For years I have used in my clinic Billroth's mixture—chloroform, 100; ether, 30; alcohol, 30, by volume—and find it preferable because the narcosis is quieter and attacks of heart-weakness do not occur any more."[5] In this country a mixture of chloroform one part, ether three parts, alcohol two parts, was advocated by Dr. Barr before the Obstetrical Society of Philadelphia.[6] Dr. Halberstadt of Pennsylvania read a paper before the Medical Society of that State in 1878 upon the use of the alcohol-chloroform-ether mixture in obstetrics.[7] It was based upon a large experience, and gave expression to strong convictions of the advantages of this combination. The writer has had a large experience with this mixture, having used it almost exclusively in surgery since its introduction. He has not, however, made use of it in obstetrics. The additions to the chloroform are efficient chiefly as diluents. They therefore obviate one of the great dangers of chloroform, that arising from the sudden inspiration of too powerful vapor. The only objection to the use of the mixture is the slower production of effect, rapidity of action being a quality of pure chloroform which peculiarly adapts it to obstetrics. Of these mixtures, Dr. Sansom's is doubtless to be preferred, but "the best diluent of chloroform is air."

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[1] Everywhere, so far as the writer could ascertain in a recent journey, except in the city of Lyons, where ether is used, and at Vienna, where Billroth uses a mixture of chloroform and ether.

[2] Gubler: *Commentaires thérapeutiques*, Paris, 1884.

[3] Parvin's *Obstetrics*, p. 391: cases of ether administration in labor, 323; of chloroform, 2.

[4] Letter of an obstetrician of the city to writer; Harris, notes to Playfair's *Midwifery*.

[5] *Obstetric Clinic*, p. 65.

[6] *Trans. Amer. Gyn. Soc.*, vol. ii.

[7] *Manual of Obstetrics*, by A. F. A. King, 3d ed., Philada., 1886.

[8] *Textbook of Modern Midwifery*, by Rodney Glissan (Oregon), 1881; letters to the writer from Philadelphia.

CHLOROFORM: ITS DANGERS.

Chloroform, being best adapted for obstetrics, and being the anæsthetic preferred in the vast majority of cases, is alone considered here. The first question in regard to it is one already foreshadowed in the preceding section: What amount of danger is there from its use? The most searching inquiry upon this point is imperative, since time has strengthened, in surgical experience, the strongest objection ever made to obstetric anæsthesia. It was urged by Meigs that there was not, and could not be, any assurance that the order in which the different portions of the nervous system succumbed to ether was reliable, and that irregularity in this respect could entail sudden death. The highest authorities have recognized the irregularity of action of chloroform when given in full doses.[1] A statement of this fact might seem to carry with it an abandonment of the agent. It would do so were there not, as a counterpoise, an experience which can be justly termed immense. The records of that experience have been carefully searched, and every case as closely scrutinized as possible. There have been a good many cases reported in which death was imputed to chloroform, but with manifest injustice. Justice and science alike demand that the remedy shall not bear the odium of causing death unless it has been properly used and under circumstances in which it alone could have been the cause of death. It is impossible to present here the details of all these cases: in some of them the administration was by an incompetent person, in others by the patient herself. Many of them rest only upon hearsay evidence; time, place, and persons of the occurrence are entirely lacking. In a number some severe complication of labor was present, such as convulsions or placenta prævia, which frequently alone is a cause of death. Until recently it could be truthfully said that not a single death had ever taken place under chloroform in labor when it was administered by a competent person. The following, however, occurred in the practice of Dr. W. K. Harrison of Chicago in 1881:

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[1] *On the Safe Abolition of Pain in Labor and Surgical Operations by Anæsthesia with Mixed Vapors*, London, 1866.

[2] *Transactions*, vol. x.

[3] *Brit. Med. Journ.*, Nov. 16, 1872.

[4] *Med. Times and Gaz.*, May 11, 1867.

[5] *Obstet. Journ. Great Brit.*, viii. 2, p. 76.

[6] *Amer. Journ. Obstet.*, xiii. p. 390; *Med. News*, April 18, 1885.

[7] Turnbull's *Manual of Anæsthetics*: alcohol, 1 part; chloroform, 2; ether, 3, by volume; recommended by Royal Med.-Chir. Society, 1864.

Patient aged 36, primipara, in good health, weight 145 pounds; urinary secretion normal. Had been in labor eight hours; os fully dilated, head descending. The severity of the suffering caused her to insist upon chloroform, and she inhaled, intermittingly, a few drops from a handkerchief. She did not become unconscious, and at the end of ten minutes began to complain of thoracic oppression and dyspnœa, and desired to be raised into the sitting position. She was raised up, and immediately the neck and face became livid. She was at once placed in the horizontal position, but had already become unconscious. She frothed slightly at the mouth, the cheeks were blown out in expiration, and after half a dozen sighing respirations at increasing intervals she ceased to breathe. The condition of the pulse was not observed. Child was not delivered, and there was no autopsy.[2]

The symptoms point strongly to embolism of the pulmonary artery, and it is to be deeply regretted that no autopsy was held. The administrator, who was experienced, is firmly convinced that the death was due to chloroform.[1]

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[1] See Holmes's *Surgery*, Am. ed., vol. iii. p. 542.

[2] *Artificial Anæsthesia and Anæsthetics*, by Henry M. Lyman, A. M., M. D., 1881, p. 194.

The inquiry as to fatal accidents from chloroform is singularly facilitated by the bitter controversy which was carried on in France, as shown in the historical sketch. Repeatedly the statement was openly made, and even as late as 1879,[2] that no death in labor had ever occurred under chloroform. Thus challenged, the opponents of anæsthesia, Depaul and Pajot, did not adduce a single instance, but conducted their opposition upon the ground that chloroform was useless, not that it was dangerous.

That there have not been more deaths when chloroform has been used is most extraordinary, when it is considered that sudden death in labor is not so very rare an event. It is an "appalling occurrence which many, perhaps most, men of much experience have witnessed at least once in their lives,"[3] and the causes of which "rest yet under a veil of profound mystery."[4] Two such cases have occurred to the writer — one just after labor began, and one puerperal — in both of which, had chloroform been administered, it would have borne the blame of the catastrophe. Looking at the number of such cases which have been reported and at the result of the search for deaths under chloroform, and it again seems that a satisfactory explanation can only be found by assuming the existence of some special safeguard attaching to the parturient woman.

The occurrence of dangerous symptoms during the inhalation of chloroform in labor is of equal import with cases of death, and deserves as careful study. The same careful and extended search has been made as in regard to deaths, and the number of cases found recorded is surprisingly small. McClintock reports one, in which dangerous symptoms supervened during inhalation for rigidity of the os.[5] Elliot gives a case in which respiration suddenly ceased after inhalation of small doses had been continued for some time.[6] Lusk reports a case, labor in second stage, inhalation of small doses during two and a half hours, when the patient suddenly ceased to breathe and the pulse became imperceptible. In all these cases the bad symptoms followed immediately upon taking a few deep inspirations, and in two of them a fresh supply of the anæsthetic had just been poured on the compress.[1] Sinclair gives a case in which, after the inhalation of half a drachm of chloroform for about half a minute, "the pulse suddenly failed and respiration appeared to have ceased."[2] Gilman reports a case in which a patient suddenly ceased breathing "after four or five deep inspirations." She had just been bled, and was therefore in a condition peculiarly susceptible to the action of the anæsthetic.[3]

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[1] The following case was reported by Dr. R. G. Curtin to the Obstetrical Society of Philadelphia, "as related to him by another physician:"

A. T., age 26, primipara. Chloroform was administered with a view to application of forceps. Patient cheerful and in good condition. About a drachm of the anæsthetic was inhaled, when the patient quickly became livid, her breathing ceased, and life was terminated.—*Amer. Journ. Obst.*, xiii. p. 391.

[2] *Gaz. hébd. de Méd. et de Chir.*

[3] Churchill's *Midwifery*, 3d ed., 1855.

[4] Hervieux: *Maladies puerperales*, t. ii., Paris, 1870.

[5] *Amer. Journ. Med. Sci.*, Oct., 1853, p. 531.

[6] *Obstetric Clinic*, and Case ii. of Lusk's paper.

There are some other cases in which the cause of the bad symptoms is apparent. In Boinet's case, a forceps delivery, the administration was committed to the husband, who became too much interested in the operation.[4] In one of Lusk's cases there was gross maladministration; the administrator "crowded the paper funnel, which contained a towel wet with the agent, over the respiratory passages." In another the patient had been in labor eighteen hours, then was delivered with the forceps in an hour, after which there was a severe post-partum hemorrhage.

The following is the only case found of danger occurring in obstetrics with anæsthesia carried to the surgical degree:

Patient aged 21, primipara at full term, presenting all the appearances of excellent health. Pains began in the night, and by 9 A. M. were severe. L. O. A.; os as large as a franc-piece. At 10 o'clock pains intolerable; chloroform given, at first as an analgesic, later to narcotism. From the first inhalations respiration was very irregular, sometimes fast, sometimes slow; under the deeper influence it became regular. At noon dilatation complete, membranes ruptured, chloroform withdrawn. At 1 o'clock the anæsthetic was resumed on account of the severity of the pains. The patient went promptly to sleep without excitement, when, at 1.15, the compress being nearly dry, "she slowly ceased to breathe, without stertor, without falling back of the tongue. The face, especially the lips and eyelids, became livid; then respiration and circulation ceased entirely." The head of the patient was promptly lowered, and mouth-to-mouth artificial respiration began. At the end of a minute and a half an expiration occurred, soon after an inspiration, and at the end of about two minutes more respiration was established. Child born alive. Convalescence normal.[5]

A faithful effort has been made to present the whole truth in regard to danger and death from chloroform during labor. The effort has extended to the literature, periodical and standard, of several countries. The meagreness of the result is striking.[6] It may be said that many cases of dangerous symptoms have never been reported. This is doubtless true. But the same may be said of ether with equal truth.[1] There must be contrasted with the number of accidents here reported the amount of experience from which they have been gathered. It cannot be given in numbers; twenty-five years ago it was stated that one hundred thousand women had been delivered under chloroform; it can only be said that it nearly covers the experience of a large portion of the world for forty years or since the discovery of the method. The safety of anæsthesia in labor is not to be shown by argument; it depends upon facts. "The teachings of etherization are from experience;" and if chloroform in labor is to be rejected on account of danger, then, to be consistent, every powerful agent of the materia medica should be given up, or even the comforts and appliances of common life, as vehicles and railroad cars, should be abandoned.

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[1] "On the Necessity of Caution in the Use of Chloroform during Labor," *Trans. Amer. Gyn. Soc.*, vol. ii.

[2] *Dublin Quar. Journ.*, Aug., 1864.

[3] *Bull. N. Y. Acad. of Med.*, vol. i. p. 292.

[4] *Ibid.*, p. 350, and *Amer. Journ. Med. Sci.*, Oct., 1853, p. 529.

[5] "Des Accidents du Chloroform chez les Femmes en Travail," par le Dr. Carafi, *Archives de Tocologie*, 1882, p. 193.

[6] A critical examination of the paper by Dr. Lusk, already referred to and quoted

There are many circumstances attending parturition which tend to ward off or prevent danger from the administration of chloroform. Sex is one of these; the record of deaths from this agent shows nearly 2 men to 1 woman.[2] The recumbent position of labor is an element of safety. Emotion is eliminated as a factor. Many deaths under anæsthetics have been, without doubt, purely emotional. The suffering woman accepts relief more than willingly; she has no dread of its means. A far stronger element of safety is the slow and gradual administration during labor. The danger of a strong impression of chloroform, and of the rapid inhalation of air highly charged with its vapor, was early pointed out;[3] the warning has been often repeated since, yet many deaths from this cause have occurred, and patients have been exposed to danger in this way, as has been seen, even in obstetrics.

But so few have been the accidents in obstetrical practice, compared with the vast number of patients submitted to anæsthesia both in natural and operative labor, these points alone have not seemed satisfactory, and attempts have been made to find in some condition of the parturient woman a special source of safety. Campbell makes a strong plea for the efforts attending labor as the safeguard. The condition

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from, will give a striking idea of the few cases to be found. Written to present the dangers of chloroform by a gentleman having large hospital and private experience, in order to collect seven cases the author has been obliged to go outside of his own practice, outside of his own city, outside of his own country, and also outside of the profession, for in one of the reported cases administration was by a hospital "sister."

[1] "It may interest you to know that only a few days ago I nearly lost a woman during a difficult breech extraction from ether asphyxia. I never saw any one so nearly dead from an anæsthetic recover."—*Letter from an Obstetrician in an Eastern City.*

[2] In Snow's statistics, 3 men to 1 woman; in Scoutteten's, 2 to 1; in Sansom's, 23 to 10; in another collection of 100 cases, 66 men to 34 women.

[3] Warren, Bigelow: *Trans. Am. Med. Assoc.*, vol. i.

of anæsthesia is one of cerebral anæmia; expulsive effort tends to counteract this. But anæsthesia is something more than anæmia of the brain, and effort is exerted during but a small portion of labor. A better argument may be made for the existence of pain as the element of safety. The record of chloroform deaths shows a very large proportion among those about to undergo an operation and during operations of a trifling character. This view has been advanced or maintained in this country by Channing,[1] Byford,[2] and Skene.[3] The experience of army surgery affords strong confirmatory proof of this view. With the weighty element of sex adverse to safety, dealing with strong, muscular subjects—a class well known to be unfavorable to the action of anæsthetics—military surgery has furnished much below its average of deaths in its very large number of administrations. Pain, and severe pain, from the ravages of shot and shell, is present in the great majority of cases anæsthetized in military practice.

A careful study of the subject of accidents from chloroform during parturition justifies the following statements:

1. But one well-authenticated case of death is on record where the administration was by a medical man, and in that case no autopsy was held.

2. Dangerous symptoms have occurred but a very few times, and then almost always from violation of the rules of proper administration.

3. The danger when chloroform is used only to the extent of mitigation or abolition of the suffering of childbirth is practically *nil;* when carried to the surgical degree for obstetric operations, the danger is far below what it is in surgery.

4. No proof can be furnished that the parturient woman enjoys a special immunity from the dangers of anæsthetics, although facts seem to indicate that such exists. Her best safeguard lies in the care and watchfulness of the administrator.

EFFECT OF CHLOROFORM UPON THE UTERINE CONTRACTIONS.

The influence of chloroform upon the various divisions of the compound process of labor requires attention. At the head of these processes stands the uterine contractions: the prime importance of non-interference of anæsthetics with them was early recognized, and the absence of any deleterious effect upon them was strongly emphasized by the friends of the method. Since then, however, the testimony upon this point has been most diverse. It has been maintained that by chloroform the uterine contractions are not affected, that they are augmented, that they are diminished, and that they are suppressed.

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[1] *Trans. Am. Med. Assoc.*, vol. ii. p. 247.

[2] Beatty's *Contributions*, p. 193.

[3] *Am. Journ. Obstet.*, vii. p. 278.

Authorities of equal standing could be quoted in support of each of these propositions. The first attempt, then, must be to explain such wide differences of opinion based upon observation of facts, and then to render judgment according to the weight of evidence and the character of the observers.

An explanation of the clashing testimony is not difficult in view of the varying circumstances under which, and the individual peculiarities of those to whom, anæsthetics are administered: 1. A temporary cessation of the pains upon commencing inhalation was early observed, and by Simpson, Channing, Siebold, and others was recognized as temporary. It is doubtless largely emotional in origin; a little encouragement and a little time suffice for its disappearance; but there can be no doubt that this has by some observers been considered permanent and caused an adverse judgment of the process. 2. Anæsthesia is much more frequently followed by cessation or diminution of the pains in the early stage of labor than later when reflex actions are powerfully excited by the descending head. 3. The effect upon the pains will vary with the depth to which the anæsthetic effect is carried. This depends upon the progressive and ascending action of the agents on the nervous system. If analgesia alone is caused, the uterine contractions are not interfered with; carried deeper, they are weakened, and in profound narcosis they may be entirely suspended. No one who has attempted a difficult version without and with anæsthetics could doubt their power over the uterine contractions. 4. There can be no doubt as to the existence of marked individual peculiarities in this respect. In certain cases, even with small doses, the pains are so affected by chloroform as to compel its abandonment. Such cases are reported by some of the warmest advocates of the agent. 5. Prolongation of the administration, if carried at all beyond the stage of analgesia, has a tendency to weaken the force of the pains and lengthen the intervals between them. Under these varying circumstances it is not surprising that there has not been harmony of opinion among observers.

Winckel made a careful study of this subject, and his results are often quoted.[1] They are to the effect that chloroform narcosis lengthens the intervals between the pains and shortens the acme of the contractions, and that it therefore increases the duration of labor. Winckel's studies were too limited in number, being confined to two normal and two abnormal cases, to justify generalization. Moreover, it is not just to restrict the inquiry to the stage of "narcosis;" it is very important that it should include the stage of obstetric analgesia.

It is a singular fact that very strong testimony as to non-interference of chloroform with the efficiency of the pains has been rendered by strenuous opponents of its administration in normal labor, and by men who have observed it carried to the surgical degree for operations, such as severe forceps deliveries and repeated cephalotripsies. Both Depaul and Pajot are positive in statement that chloroform does not exercise any influence upon the uterine contractions.

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[1] *Verhand. der Gesells. für Geburts. in Berlin*, Nov. 22, 1864.

A careful review of all the testimony, together with an estimate of its value based upon the amount of experience and character of those who render it, leads to the following conclusions, with every one of which the experience of the writer coincides:

1. The action of chloroform upon the uterine contractions may vary according to the period of labor and the peculiarities of the patient, and especially with the degree to which anæsthesia is carried.

2. A temporary diminution or cessation of uterine action is not at all infrequent. Occasionally, however, chloroform permanently abolishes the pains.

3. Obstetric anæsthesia, or analgesia, has no effect, as a general rule, upon the uterine contractions.

4. In surgical anæsthesia the energy, frequency, and duration of the contractions may be, and generally are, lessened; in deep narcosis uterine action is in abeyance.

5. Upon withdrawal of the anæsthetic, and with disappearance of the anæsthetic effect, the uterus promptly resumes its functions.

6. The tendency of the agency is, then, toward causing a diminution of uterine action, and this tendency should be kept constantly in mind by the accoucheur.

THE INFLUENCE OF CHLOROFORM UPON THE ACTION OF THE ABDOMINAL MUSCLES.

As labor enters upon its expulsive stage the muscles of the abdomen take part in it. Called into action by an influence emanating from the pelvis and reflected from the upper part of the spinal cord, they give energetic assistance. The influence of anæsthetics upon this accessory force has also been doubted, affirmed, and denied. Still, by far the greater amount of testimony is favorable to the non-interference of anæsthetics with their action, while the statement, in general terms, may be the same for these as for the uterus. Longet, at the earliest period of the history of the subject, noted the continuance of the action of these muscles while all others were relaxed, and explained it physiologically. They are accessory muscles of respiration: like those muscles, their action is both voluntary and reflex, and, having their origin near the respiratory centre, anæsthesia must be carried very deeply before they are affected. Clinical experience confirms this. Anæsthesia in its mildest degree does not affect them; as it is deepened, their action is weakened; in profound narcosis it is suspended.

While the abdominal muscles aid in the delivery, and their assistance should not be needlessly prevented, still it is not essential. The uterus itself is entirely competent to effect delivery, as shown by two series of cases: 1st, by those in which delivery has taken place when the uterus is outside the abdomen; 2d, by those in which delivery has occurred *post-mortem.*[1] There are many cases of both these classes on record, and they tend to show that the importance of the aid rendered by the abdominal muscles in parturition has been exaggerated.

Upon the Os and Cervix.—In labor there should be harmony of action between the different portions of the uterus; dilatation of the cervix should occur in due time and in preparation for expulsive effort of the body and fundus. This harmony is often lacking, and the process is delayed by unusual resistance of the os. This abnormal condition has been referred to rigidity, to spasmodic action, and to an induration of tissue resulting from former plastic deposit, and doubtless is dependent, in different cases, upon each. Whatever may be the exact pathological condition, the suffering of this stage of labor is often so severe as urgently to demand relief. The woman is not now sustained and cheered by that assurance of progress which she feels during expulsion, and hours of suffering bring only exhaustion and discouragement. The relaxing and analgesic effects of chloroform peculiarly adapt it for this condition of things. The cervix and os are supplied with nerves from the cerebro-spinal system, and therefore pass early and readily under the influence of the anæsthetic. It is not so certain, however, that relaxation will follow inhalation as amelioration of suffering. If the rigidity depend upon plastic deposits, relaxation will not be effected. Such cases are rare. In those where the os is thin, sharp, resisting, hot, and dry, and sensitive to the touch, chloroform, if administered for a time, often effects a most favorable change. This is the condition for which heroic bleeding was once the approved remedy. Barnes, who is no warm advocate of chloroform, says that it is here "often of signal service."[2] Dutertre claims that to be efficient the anæsthetic must be often pushed beyond the stage of analgesia. This view is sustained by the benefit often resulting when the first stage of labor is tedious from suspension of the pains for a time, the membranes being unruptured, by a full dose of morphia.

Of late years chloroform has been largely superseded by chloral for this condition of things, its action seeming peculiarly adapted to the early stages of labor, while chloroform, if resorted to, may be demanded for too long a time. There are some of these cases, however, in which chloroform renders immediate relief and most efficient service. They are those in which expulsive force is in advance of dilatation. The pains are active and strong, and the os yields passage to the head only from the *vis à tergo*. The woman restrains to her utmost bearing-down effort on account of the horrible suffering. The rapid and efficient action of chloroform peculiarly adapts it for such cases. It often acts like magic. The patient expresses relief in the liveliest manner, brings her voluntary powers to bear, and the duration of labor is decidedly shortened as well as its suffering alleviated.

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[1] Duer: "On Post-mortem Delivery," *Amer. Journ. Obst.*, xii. No. 1.

[2] *Obstetric Med. and Surg.*, p. 744.

UPON THE PERINEUM.—The influence of chloroform in promoting relaxation of the muscles of the perineum has been emphasized from the earliest period of its use, and has been over and over again repeated since. The nerves which excite these muscles to action, having their origin in the lower portion of the spinal cord, necessarily submit early and completely to the anæsthetic. That all resistance of the perineum is abolished when its muscles are paralyzed cannot, of course, be maintained. Much of this depends upon other constituents of this compound structure, as the fibrous and the adipose tissues, as well as the skin. Due consideration of this fact renders a ready explanation of the much greater apparent effect of chloroform upon the perineum of multiparæ than of primiparæ. In the former the aponeuroses have undergone previous distension, and it is at this point in this class of patients that chloroform is often seen to markedly shorten labor.

A very important question must be considered here: Does this relaxation promote, or act as a safeguard to, rupture of the perineum? That lessened resistance of an annular structure will promote the passage of a solid body through it without tearing would seem a self-evident proposition. Yet there are weighty names on the negative side. Johns of Dublin attempted to show that the proportion of ruptures of the perineum is 1 : 93 without chloroform, and 1 : 27 with it. Barnes believes that ruptures are more frequent under anæsthesia.[1] Spiegelberg would seem to favor this view, since he advises cessation of inhalation during extrusion of the child, "because we often need the unclouded conscious assistance of the woman for preservation of the perineum."[2] Cazeaux says that further observations are necessary to determine the question. He relates some cases in which rupture took place under deep anæsthesia, and justly adds: "Perhaps it would be well to remember how variable is the resistance of the perineum in different individuals, and how difficult it is to foresee what will occur in a given case."[3]

Casting aside the intricacies of biological physics, and looking to the most numerous and best authorities, giving, moreover, the lessons of experience, it may be boldly stated that no one thing is more efficient as a preventive of rupture of the perineum than the administration of chloroform. It effects this—1st, by a certain amount of relaxation of the structures; 2d, by preventing those sudden movements of the body made by the woman in the agony of suffering, and by which rupture is often caused; 3d, by lessening, and when carried to the deeper stages by abolishing, expulsive effort, whereby the advance of the head is slowed, time is gained for the tissues to give, and the exit of the head can be effected in the interval rather than at the acme of uterine action.

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[1] Dutertre: *op. cit.*, p. 100.

[2] *Lehrbuch der Geburtshülfe*, p. 194.

[3] *Traité des Accouchements*, neuvième ed., p. 953.

Upon the Duration of Labor.—It will be seen from the foregoing that it is by no means easy to decide whether chloroform lessens or increases the duration of labor. Upon the one hand, anæsthesia tends to weaken the pains and diminish expelling force; upon the other, it regulates, and sometimes increases, the uterine contractions, and by promoting relaxation it diminishes resistance. It is not surprising that authorities should differ widely upon this point as their observation has varied. Some have maintained that "chloroform accelerates labor in a greater number of cases than it retards it."[1] Lusk, again, deems it "certain that those who use chloroform habitually will find themselves compelled to resort to the forceps with somewhat increased frequency" —a proposition which may be accepted if the word "probable" be substituted for "certain." But there is a possible source of fallacy here which should by no means be overlooked. Kucher found the forceps required twice as often on account of deficient contractions of the uterus among the well-to-do of New York as among healthy servants and peasant-girls.[2] Doubtless Snow expressed at an early day the truth of the matter: "Chloroform produces no effect on the duration of labor in the whole number of cases, but individual labors are either accelerated or retarded by it."[3]

In Promoting Hemorrhage after Delivery.—An inquiry as to the influence of chloroform upon the contraction and retraction of the uterus immediately after delivery is closely allied to one as to its effect during labor. That authorities should differ widely upon this point is not surprising when the difficulties are considered which attend a clinical study of it. Hemorrhage is a not infrequent sequel of labor, and it is evident that the *post hoc* and the *propter hoc* are easily confounded. Channing mentions a case of severe post-partum hemorrhage in which he had offered ether, but it had not been taken. The writer has had a similar experience as to chloroform; also a case in which a severe hemorrhage occurred several hours after delivery and after he had left the patient's house, and no anæsthetic had been given. On the other hand, the adduction of cases in which hemorrhage had formerly occurred, and then with an anæsthetic has been absent, are valueless in support of the doctrine which has been held by some, that chloroform lessens the liability to this accident. In order to answer the question as to the influence of anæsthetics in causing post-partum hemorrhage by statistics, an immense collection of cases would be necessary, conducted with and without the agents, and the reports should include the ages of the patients, the number of previous deliveries, the nature and duration of the individual labor, and especially the depth and duration of the anæsthetic influence. No such statistics exist, and a judgment must be formed from the opinions expressed by competent observers. The French school, hostile to chloroform in natural labor, has never brought the charge against it of promoting post-partum hemorrhage, while their observations have been of cases of deep anæsthesia continued for hours.[1] The cautious statement of many authorities not over-favorable to chloroform should also be noted. Blot says:[2] "It has *seemed* to me that the quantity of blood lost immediately after delivery has been somewhat [*un peu plus*] more abundant than usual." Cazeaux gives but a doubting affirmative answer to the question whether chloroform favors hemorrhage.[3] Both Hall Davis[4] and Dr. Edis[5] state their belief that anæsthesia has a *tendency* to favor post-partum hemorrhage. If these expressions are ambiguous, they clearly show that the question is not an easy one even to men of large experience. Dutertre,[6] after a full examination of authorities, sums up by saying: "There is no proof that hemorrhage is more frequent after labors with anæsthetics." Dr. Fordyce Barker has recently devoted a special paper to this subject.[7] He is strongly convinced that chloroform does not promote post-partum hemorrhage. His experience is striking: having administered it in several thousand cases, the only case of hemorrhage met with occurred when the anæsthetic was not given.

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[1] Barker: *Bull. N. Y. Acad. Med.*

[2] *Puerperal Convalescence*, by Jos. Kucher, New York, 1886.

[3] *Am. Journ. Med. Sci.*, Oct., 1853, p. 526.

On the other hand, some late and accepted authorities are of different opinion. Playfair[8] believes that it has "a marked effect in predisposing to post-partum hemorrhage." Lusk[9] says: "It certainly favors the relaxation of the uterus and predisposes to hemorrhage." These statements are made without qualification, and without reference to the degree of anæsthesia; which is a most important point. That effect upon uterine action after delivery should vary with the depth of the anæsthesia, as it does during labor, is as reasonable as it is in accord with experience; and Zweifel[10] we believe is correct when he says that only "when chloroform is inhaled so long and in such quantity that all striated muscular fibre relaxes" is there danger of a post-partum atony. However diverse opinions may be upon this question, the practitioner will do well in practice to bear always in mind the *"tendency"* of the agent he is using.

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[1] Pajot: *Dict. encycl.*, art. "Anæsthésie obstétricale."

[2] *Op. cit.*

[3] *Op. cit.*, p. 955.

[4] *Trans. London Obstet. Soc.*, vol. v. p. 137.

[5] *Brit. Med. Journ.*, Nov. 16, 1872.

[6] *Op. cit.*, p. 96.

[7] *Philada. Med. News*, Feb. 12, 1887.

[8] *London Lancet*, Feb. 21, 1874; *System of Midwifery*.

[9] *Trans. Am. Gyn. Soc.*, ii. p. 208.

[10] *Lehrb. der Geburts.*, 1887.

UPON THE PUERPERAL CONDITION.—There is no evidence that the administration of chloroform during labor exerts any prejudicial influence upon the puerperal stage. Since a very early period in the history of the method no such charge has been made. The experience of the writer is fully in accord with that of many authorities, who state that patients frequently volunteer testimony as to a more satisfactory condition after having taken the anæsthetic. There is an absence of fatigue and of muscular soreness and lameness almost always experienced after labor.

UPON THE CHILD.—Neither does chloroform exercise any injurious effect upon the child. The question of a possible injurious influence of this agent was lately reopened, when it was established that when chloroform had been inhaled by the mother it could be found in the blood of the child.[1] Hofmeier attributed jaundice of the newborn directly to this, but he is alone in doing so. Zweifel considers the subject at some length,[2] and says distinctly that he has abandoned any belief in this view, "because I could not substantiate a greater frequency or intensity of the icterus than in other children under similar external surroundings." Neither had he seen any bad effect upon the health of the child from the icterus when it did occur.

CHLOROFORM: MODE OF ADMINISTRATION.

A good remedy will fail of its effects if not properly administered. This truism especially applies to anæsthetics, even in surgical practice, while in obstetrics care and skill are essential to the successful use of them, and out of all proportion to the attention bestowed upon the subject in the textbooks. No one can be a good administrator of an agent so powerful as chloroform without a careful study of the chemical, physical, and vital principles concerned. A few of these should be clearly understood. As to the exact nature of the change which it effects in the cells of nervous centres it is needless to inquire. It is sufficient to know that the effect is by a direct action upon these cells, according to all authorities, and that the chemical theory of former times, which referred the action to suspended oxygenation of the blood, has been abandoned. Neither is artificial anæsthesia cerebral anæmia, although this state accompanies it. Chloroform belongs to that class of poisons which have an elective action upon the nervous system, selecting certain parts and leaving others alone. Bernard happily likens anæsthetics to "physiological scalpels," which can separate portions of the system more skilfully than the scalpel of the anatomist.[1] A special affinity to the nervous system is shown by the preponderating amount found in it; thus, when the amount in the blood is 1 part, there will be in the brain, of ether, 3.25, and of chloroform, 3.92 parts.[2]

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[1] *Berlin klin. Wochenschrift*, 1874, No. 21; "Verhand. der Naturförscher in Hamburg, 1876," *Archiv für Gyn.*, Bd. xii. p. 235.

[2] *Handbuch der Geburtshülfe*, 1887.

The rapidity of the action of chloroform is an important fact. Entering the system through the pulmonary circulation, it passes directly, with the blood-current, to the nervous centres. In like manner and with the same rapidity the system clears itself, and cessation of administration ensures speedy cessation of effect. The fact enforces attention to the importance of intermittence of the inhalation. Paul Bert found that dogs in a mixture of air and chloroform vapor which required an hour to produce insensibility invariably died at the end of seven hours. Intermitting administration could be continued indefinitely with safety.[3] The residual air of respiration should also be held in mind by the administrator of chloroform. The cumulative action of this agent, of which a great deal was formerly said, is only the additional effect of the amount of vapor contained in this air; in other words, the effect of chloroform will continue to be progressive after the influx of vapor by the tidal current of respiration has been stopped, until all that is in the air of the lungs and bronchial tubes has passed into the blood. The vapor of all anæsthetic agents is very much heavier than air; and this fact has an important bearing upon the position of the mouth and nose of the patient in relation to the surface from which it is inhaled. Temperature has a powerful influence upon the amount of vapor which air will carry. With a change of the thermometer of 20° the amount of chloroform vapor in the air doubles. Thus at 65° it will take up 15 per cent., and at 85°, 30 per cent. Such differences occur in the ordinary weather of different seasons. The amount carried by the air is also increased by a current. The quantity of chloroform vapor in air which it is safe to administer, 5 per cent. and below, was early worked out by Snow, and the danger of larger amounts clearly shown. While it is not possible for the practitioner to measure percentages of vapor, and while there is a "clinical dose" the measure of which is the effect, the danger of too heavily charged air cannot be over-emphasized. Bert found that dogs remained unaffected for any length of time in air containing 2 grammes of chloroform to each 100 liters; with 10 grammes they became anæsthetized rapidly and died suddenly; with 20 grammes death was by "sideration" and preceded anæsthesia.[4] The record of chloroform accidents shows many cases plainly due to the sudden inspiration of air heavily charged with the vapor.

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[1] Bernard: *op. cit.*, p. 124.

[2] Perrin: *op. cit.*

[3] *Annuaire de Thérapeutique*, Bouchardat, 1884.

[4] *Ibid.*, 1864.

Essential requisites of any apparatus or plan for the safe administration of chloroform are that it shall ensure a thorough admixture of air with the vapor, also give the power of graduating the process and limiting the dose. Nature has prepared an instrument which fully meets these demands. It is a hollow or cup-shaped sponge, the cavity of which will admit the fist and thus cover easily the mouth and nose. This article, dipped in warm water, and squeezed out, is unequalled in convenience and efficiency. It is soft and pliable; it is so porous that the supply of air cannot be shut off; if pressed together after chloroform has been sprinkled on it every little interstice, as it gives passage to air, yields to that air its modicum of vapor. The only device at all comparable with it is Esmarch's mask, and that is not so readily carried. An essential adjunct to this sponge is a bottle which will only permit the escape of the liquid by drops. A perfume-bottle with a screw-cap tube is the best, or an ordinary perforated cork will answer the purpose. Provided with these the administrator has perfect command over the rate of administration, while the mode almost universally recommended and followed of pouring chloroform on a handkerchief or napkin is faulty in the extreme. It is not only faulty, but dangerous. This is not a matter of opinion, but of the facts of physics. The current of inspiration can never be equably charged with the vapor of a liquid which is poured on a cloth in patches, so that it does not pass through, but only over, the moistened surface. The patient cannot fail to get at one breath air only slightly charged with the vapor, and at another that containing a dangerous amount.[1] It is with the utmost confidence that the conviction is expressed that many practitioners have given up the use of chloroform in obstetrics from neglect of attention to these minute points. In every department of medicine there are many *great little* things.

The pain or circumstances of natural labor demanding chloroform, its acceptance or rejection should rest entirely with the patient and her friends. A due regard to his own interests should restrain the practitioner from doing more than to offer the means of alleviation. Before proceeding to the administration the condition of the heart should be ascertained. Then the accoucheur will do well to advise the patient that the object is relief rather than abolition of suffering; also, that the effort will be tentative at first, and that its continuance must depend upon the effects. This is especially necessary in the early period of labor. Then, sprinkling a few drops of the liquid on the sponge and squeezing it together, it is applied to the patient's mouth and nose. If coughing is excited, the vapor is altogether too strong. If the pains lessen in force or cease, a few words of encouragement, a little delay, and recommencement with a very small dose will generally obviate the difficulty. When the patient shows that she is passing under the influence by expressions of relief, the sponge is withdrawn, replenished, and held closed in a folded towel to prevent evaporation. The patient will indicate, if told to do so, when a pain is approaching; then two or three deep inspirations will anticipate the suffering. The object is to keep her in the first stage of anæsthesia of authorities. These are three by Sansom: 1, sopor; 2, stupor; 3, stertor.[1] But Campbell divides this first stage again into three: 1, an initial period of simple amelioration; 2, incomplete analgesia; 3, complete analgesia. But the different degrees of narcotism glide insensibly into each other. The distinction of stages which Snow makes is a good practical one. In the first the patient retains a perfect consciousness of where she is and what is occurring around her; in the second there is no longer correct consciousness.[2] The respiration of the patient and the appearance of her countenance indicate her condition. In obstetric analgesia, and with a small amount poured on the sponge, there is no need of watching the pulse. After the patient has ceased to make voluntary remarks a question will enable the administrator to judge of the extent of the influence by the readiness and coherency of the answer. A better description of this process has never been given than that by Channing:[3]

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[1] "Nothing is more simple than the compress, but nothing is worse; its employment is the inversion of all scientific precision."—PAUL BERT.

"The object in ordinary midwifery practice, or in the severer forms of labor-pains, in the use of etherization[4] is to *diminish* suffering. There is much of this pain which is tolerated readily, and from this the patient does not demand relief from extraordinary agents. So true is this in practice that cases daily occur in which etherization is induced, and in which the patient determines exactly its extent. In the intervals of uterine contractions the instrument is removed by the patient or by her direction given in some way, and which is at once understood. She knows when the pain is coming and demands the inhaler. She graduates, so to speak, the supply exactly by the demand; and in this way is presented to the observation of the practitioner one of the most important and interesting agencies in operation for relieving suffering, sometimes agony, which he ever notices."

As the head distends the vulva the effect of chloroform is carried more deeply to meet the acuter suffering of this stage. Full surgical anæsthesia may be required, and is often necessary, as an efficient aid in

[1] *On Chloroform*, London, 1865. [2] *Op. cit.*, pp. 35, 37.

[3] *Op. cit.*, p. 74.

[4] It will be remembered that Channing applies this term to the effects of chloroform as well as ether.

delivery of the head without injury to the perineum. The head being delivered, the administration should cease.

No assistant is necessary for the administration in ordinary labor. This is evident during the greater portion of labor, when an examination is only occasionally needed. But toward the close of the process, when the exit of the child requires the constant application of one hand, the accoucheur can still conduct the process himself with a little management. If the patient is in the dorsal position, she has only to be brought close to the edge of the bed to enable the accoucheur to reach her face with one hand while the other supports the perineum. In the English position, if the hips are brought close to the edge of the bed, the patient lying diagonally across it, the practitioner from behind can also control both processes. The necessity for these minute directions has been more than once made evident to the writer.

The length of time during which the inhalation of chloroform may be continued would be difficult to determine. Paul Bert's experiments have indicated its harmlessness with small doses and an intermittent administration. In practice Snow has continued it for thirty-one hours,[1] Simpson fourteen hours, Protheroe Smith twenty-eight hours. Aubenas[2] gave it during eighteen hours for a case of convulsions, and saved both mother and child. All these have been surpassed outside the domain of obstetrics. Brown-Séquard in a case of periodically returning epilepsy kept a patient under the influence of chloroform during seven consecutive days. The attack was warded off and the patient had no more for two years. The case was reported to show "that it is possible to keep a patient under the influence of chloroform a very long time."[3] Snow is undoubtedly correct in saying that "the quantity of chloroform given in labor might be continued daily for an indefinite period without appreciable effect on the health."[4]

It is evident from the foregoing that the administration of chloroform in labor is no light or easy task. It is too serious a matter not to be done well; to do it well requires great care, close attention, constant watchfulness, and entails no small amount of extra fatigue.

FOR OBSTETRICAL OPERATIONS.—The administration of anæsthetics for the operations of obstetrics is surgical anæsthesia. Its benefits here have never been called in question, a resort to it whenever indicated never opposed. The methods of the one process are exactly the same as those of the other, and only in one point do they seem to differ. That point has already been alluded to—the marked absence of accident in obstetric practice. No operations of surgery are more severe than turning in neglected cases, high-forceps operations, or repeated cephalotripsies. None require deeper or more prolonged anæsthesia. Yet the absence of accident is almost complete, and so large has been the happy experience that the explanation seems forced of a special immunity on the part of the pregnant woman.[1]

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[1] *Op. cit.*, p. 323. [2] French translation of Naegele and Genser, 1880, p. 786.

[3] *Annuaire de Thérap.*, Bouchardat, 1884, p. 33.

[4] *Am. Journ. Med. Sci.*, Oct., 1853, p. 526.

Under chloroform the operation of version is very much facilitated and rendered possible in cases which without it would be impracticable. Indeed, it was in cases of neglected cross-positions that anæsthetics won their earliest and most brilliant triumphs. The most determined opponents of their use have testified to their benefits in such cases, and experienced accoucheurs have succeeded in turning under chloroform when all previous efforts had failed and all preparations had been made for embryotomy.[2] In 17 cases of obstructed labor in women who had previously had craniotomy or embryotomy performed, version under chloroform gave 9 living children and 7 more with heart-pulsation.[3]

In proceeding to administer chloroform for version the obstetrician should be fully alive to the fact that anæsthesia must be carried very deeply. All voluntary effort must be rendered impossible; even in the deepest narcosis, as manifested by stertorous respiration, the introduction of the hand will not always fail to excite uterine contractions. "In animals contractions of the uterus continue during the deepest anæsthesia, and persist even after they have ceased in the heart."[4] An assistant is most desirable in these cases, and should always be obtained if possible. Still, a neglected shoulder presentation at night, many miles from professional assistance, and urgently demanding relief, may present itself to any practitioner at any time. A few directions may aid in meeting the exigencies of such a case. See to the placing of such assistants as may be at command, and explain what will be required of them. Place the patient in proper position, across the bed, the hips free of the edge, and take measures for her being kept there. Carry the anæsthetic deeply, and do not attempt the operation until there is stertorous, or at least heavy, breathing. In committing the continuance of the administration to a non-professional person the drop-tube is a valuable resource; directions to vigorously shake the bottle will be necessary in order to get out enough of the liquid; an over-dose is not easy, and with the patient on her back the accoucheur has full view of her countenance and can watch the respiration. The imagination has not been drawn upon for such cases, and experience has taught the dependence of success upon attention to details. Just here have been furnished some of the most striking instances of the benefits of anæsthesia, and the number of lives saved by it in this class of cases will never be known.[1]

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[1] Perrin: "Proc. Soc. de Chir.," *Union Méd.*, Oct. 10, 1876.

[2] Hall Davis: *Trans. London Obstet. Soc.*, v. p. 137.

[3] Kidd: *Med. Times and Gaz.*, July 4, 1863.

[4] Fredet: *op. cit.*

In administering chloroform for forceps operations the question was formerly much agitated whether the instrument should be applied before anæsthesia was induced or afterward. The objection formerly made, that in the latter case the patient could not indicate hurting by the instrument, is trivial. Either course may be pursued, but the former seems in every way preferable, and has always been pursued by the writer. As traction is made, or in anticipation of it, the inhalation should be commenced. Assistance is desirable even in the practitioner's interests; in severe cases it is indispensable. Still, many forceps cases have been and may be conducted, and chloroform administered, without aid. The operator has the same control of the patient and command of the process as in version. With experience such cases can be managed very well when circumstances do not permit of assistance.

Indications.—Chloroform being given in labor as an analgesic, pain is the indication for its employment. But while there is no labor without pain, it is not every labor which requires chloroform. In muscular women of the lower classes labor frequently causes more effort than suffering. In women of nervous type, whose systems have been enervated by refinement and luxury, the suffering is apt to be acute. In all classes there are some happy exceptions in whom parturition proceeds rapidly and the pain is not severe enough to tax the nervous system and is well borne. The necessity or advisability of chloroform to facilitate labor must rest with the obstetrician; as a means of relieving pain it should depend upon the patient. If she demand it, there is no reasonable ground for a denial.

There are other indications besides pain for the use of the remedy, chief among which is a deviation of the pains from the normal type. Not infrequently they are spasmodic in character, irregular as to recurrence, and doubtless affect but a portion of the uterus. In such cases chloroform has often a most happy influence, bringing harmony out of discord, restoring the normal, and evidently shortening the duration of labor. If irregularity be a marked feature, the os being but little open and the waters not discharged, a good dose of morphia will probably be best, and there is no doubt that chloral may often be used to better advantage than chloroform in the early stages. Still, the statement above made rests upon experience as well as abundant authority. Sometimes the pains deviate from the normal by being more than usually severe, and they follow each other closely. In these cases chloroform gives the most marked and certain relief. The type of a labor which best shows the benefits of anæsthesia is one in which expulsive power is active and in excess of dilatation, in which the head is crowded through parts not yet prepared for its passage. Carried deeply enough to moderate the violence of these abnormal contractions, chloroform here renders brilliant service.

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[1] In the village where the writer began professional life, before anæsthetics were much used, two women died undelivered, with shoulder presentation, within four years. He saw but one of the cases, and that only just before death.

Certain conditions of the general nervous system demand chloroform. Some patients are nervous and hysterical, controlled with difficulty, and the commencement of labor is marked by a very considerable excitement. This abnormal condition is soon soothed and quieted down by the administration of an anæsthetic.

There is a general agreement of authorities that the best time for commencing administration is when the os is nearly opened and expulsive pains are about to begin. Whether anæsthesia has been needed earlier or not, it will very likely be demanded now. The most painful periods of labor are when the head distends to the utmost and clears the two resisting circles of soft parts, the os and the vulva. During that part of the process in which the head is moulded to the bony canal, which sometimes requires many pains, the anæsthetic effect is not so much needed, and chloroform may often be dispensed with. The stretching of soft parts, however, is often agonizing, and at the vulva relief is most urgently called for. At this period the anæsthesia may, and often must, be carried to the surgical degree. With entire unconsciousness and complete acinesia not only is acute suffering saved, but delivery of the head is effected with less danger to the integrity of the perineum than under any other circumstances.

The head having been delivered, the administration should immediately cease. The third stage of labor does not demand it. The only question as to anæsthesia during this period is whether it is justifiable or advisable to resort to it for manual delivery of the placenta in cases of irregular or "hour-glass" contraction of the uterus. In some of these cases the constriction is close, at once difficult and painful to pass with the hand. There seems no good reason why suffering should not be saved here as well as elsewhere, and the relaxing as well as the analgesic effect of chloroform utilized. For this complication of labor it was used the first time by Snow, and numerous authorities advise its use in these circumstances and testify to its efficiency and safety. It should be said, however, that the high authority of Lusk is on the opposite side. He is very positive as to the danger of chloroform in the third stage of labor.[1] The single case reported by him was one of severe, prolonged, and complicated labor, and as the death took place "some hours" after the administration ceased, the anæsthetic was, in all probability, but a minor factor in causing it. The writer has given chloroform a number of times for removal of a placenta retained by irregular contraction, and should not hesitate to do so again. A dose of ergot should always precede the administration in these cases, and, indeed, whenever chloroform has been given deeply or for a considerable period of time. In the early days of obstetric anæsthesia the conjoint use of ergot and chloroform was very common. Now, however, the oxytocic is rarely if ever given before the birth of the child, but its administration just after delivery to antagonize any relaxing effect which chloroform may have is good practice.

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[1] *Trans. Am. Gyn. Soc.*, vol. ii.

CONTRAINDICATIONS.—It may be stated, in general terms, that no contraindications exist to the administration of chloroform in labor when the severity of the pain demands it. Diseases of the vital organs and some special conditions, however, demand careful consideration. In cases of disease of the brain, heart, or lungs the same general principles must guide the obstetrician as the surgeon. Organic disease of the brain is met with very rarely in parturient patients. The functional neuroses are no bar to the administration of anæsthetics. Chloroform is one of the best remedies for any hysterical symptoms which may occur in labor. Some severe outbreaks witnessed by the writer during inhalation for surgical operation have yielded speedily to steady continuance of the administration. Occasionally an epileptic attack is brought on by inhaling chloroform in subjects of the disease. The well-known value of this agent in puerperal convulsions, the experience of Snow, who has "many times administered it to epileptics for operations without exciting a fit,"[1] and the experience of Brown-Séquard in preventing attacks, already given, furnish satisfactory evidence that an epileptic patient in labor is better off with chloroform than without. Hysteria is most likely to occur in the earlier stages of administration; epilepsy, on the contrary, in the later.

Advanced disease of the lungs will not often be seen in connection with labor. In surgery chloroform has been administered to patients suffering from phthisis, even in the last stages, and in those who have had attacks of hæmoptysis without ill effects.[2] Very few instances of the complication are to be found. The following show what has been done:

"M. Lucas Championnière has given chloroform during four hours to a woman suffering from tubercular lesions for some time, and who was breathing badly. The result was so satisfactory that the woman begged for the chloroform after delivery: she was gratified for more than an hour. In another case, where cavities of considerable size had been diagnosticated, and in which the temperature was 39° [102.2 F.], anæsthesia continued for two hours gave results not less favorable."[3]

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[1] *Op. cit.*, p. 52.

[2] Snow: *op. cit.*, p. 53; Dr. A. K. Gardner, *Bull. N. Y. Acad. Med.*, vol. i. p. 312.

[3] Dutertre: *op. cit.*, p. 281.

Diseases of the heart are of especial interest in this connection on account of their not infrequent occurrence in parturient women and from the known influence of chloroform upon this organ. Snow worked out the surgical aspects of the question, and his experience and conclusions have guided surgeons ever since. They may be briefly stated to be, that fatty degeneration of the heart alone should forbid the administration of chloroform, and the diagnosis of this can only be presumptive—that even when this is present in a patient having to undergo a severe operation there is less danger with chloroform than without. In all forms of valvular disease chloroform, "when carefully administered, causes less disturbance of the heart and circulation than does severe pain."[1] The details of cases given fully sustain this opinion.

While actual experience of the administration of chloroform in labor complicated with heart disease is not abundant, all that can be found justifies the statement that in obstetrics the same principles should govern as in surgery. The opinion of all who have studied this portion of the subject coincides. Thus, M. Lucas Championnière says: "If I recognized an organic affection of the heart without pulmonary complications, I should rather give the woman chloroform than to let her suffer." Vergeley of Bordeaux wrote upon this subject, and his conclusion was that "diseases of the heart are not a contraindication to the use of anæsthetics."[2] The most complete study of the question has been made by Dr. Angus Macdonald,[3] and in his book will be found the physiological argument showing how straining and effort are peculiarly dangerous in cardiac affections. But his conclusions, drawn from practice, are better than reasoning: "In almost all the cases [of heart disease with labor] I have met with, chloroform has been given, and apparently with benefit, during delivery. If carefully administered I think it cannot but be useful in all cases."

The following is a striking case: "Mrs. M—— has insufficiency of the aortic valve. Has had six children; the first three were born before she came under my care. In her fourth confinement I was afraid to administer chloroform, because I then shared the popular professional opinion that chloroform ought not to be given when there was organic cardiac disease. My patient fainted several times, and filled me with serious apprehensions for her safety. I then learned that she had experienced the same dangers in each of her previous confinements. In her fifth and sixth confinements I administered chloroform with the most gratifying results. Labor was accomplished without fainting, and her convalescence was extremely satisfactory. My experience in this and other cases satisfies me that a patient laboring under organic disease of the heart will pass through her confinement with greater safety when chloroform is used than when it is not used."[1]

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[1] Snow: *op. cit.*, pp. 54, 57.

[2] Dutertre: *op. cit.*, p. 278.

[3] *The Bearings of Chronic Disease of the Heart upon Pregnancy, Parturition, and Childbirth*, London, 1878.

Dr. Fordyce Barker states it as his opinion that disease of the heart, lungs, and kidneys is an additional reason for resorting to anæsthesia in midwifery, as the vital forces during labor were saved rather than exhausted by the anæsthetic.[2] In his latest communication upon the subject[3] he gives a graphic description of a case of cardiac disease with labor in which the inhalation of chloroform not only gave decided relief, but banished very threatening symptoms. The pulse, which had been very weak and irregular, with a pallid countenance and very bad appearance, became under the anæsthetic regular and stronger, and the dangerous appearance passed away. Since then he has seen several cases in which labor was dangerously complicated with heart troubles, and which terminated favorably, in his opinion, solely from the use of chloroform.

Parvin says that disease of the heart does not necessarily contraindicate anæsthesia in labor.[4]

Dr. Elliot gave ether in a case of labor with mitral regurgitation for delivery with the forceps, and chloroform in another of premature labor where the patient had a loud systolic murmur.[5] He would use ether in these cases rather than chloroform, " in obedience to the general voice of the profession, rather than from any belief that there is more danger in obstetrics from one agent than from the other." He is also certain from his records that he has given chloroform with safety in cases where the microscope afterward proved that fatty degeneration was present.[6]

Dr. A. K. Gardner also administered chloroform in cases of fatty degeneration and of valvular disease of the heart.[7]

There are few points connected with anæsthetics upon which testimony is more unanimous than as to their beneficial effects in labor complicated with heart disease. It is apparent that the practitioner into whose care these perilous cases fall should fully explain to the patient's friends the facts, possibilities, and necessities of the case, and that in the administration of the anæsthetic he should proceed with the utmost caution.

Diseases of the kidneys accompanied by albuminuria are no contraindication to the use of chloroform. It is not only a leading remedy in puerperal convulsions, but renders efficient service in warding off attacks. Kidney disease is, however, a distinct contraindication to the use of ether. The danger from it when these organs are affected was first pointed out by Emmett.

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[1] P. C. Williams, M. D., *Obstet. Journ. Gt. Brit. and Ireland*, vol. vi. No. 6, Supplement (from *Trans. Med. and Chir. Faculty of Maryland*, 1878).

[2] *Bull. N. Y. Acad. Med.*, vol. i. p. 354.

[3] *Medical News*, Feb. 12, 1887.

[4] *Science and Art of Obstetrics*, 1886.

[5] *Bull. N. Y. Acad. Med.*, vol. i. pp. 295, 299.

[6] *Obstetric Clinic*, p. 68.

[7] *Bull. N. Y. Acad. Med.*, vol. i. p. 312.

A condition of acute anæmia produced by large losses of blood is one in which the administration of chloroform is dangerous, and such a condition is a contraindication which should prevent its administration unless under pressing necessity. Bert found that animals from whom blood had been freely taken succumbed to chloroform much more readily than others, and died more frequently. There have been several cases of dangerous symptoms when chloroform has been resorted to in cases of placenta prævia. It is probable that an explanation of the possible danger may be found wholly in physics. With comparatively empty blood-vessels absorption is extremely rapid from every source. Under these circumstances a larger quantity of vapor passes into the system in a given space of time. Should an anæsthetic be called for under these circumstances, ether would doubtless be the safer, or at least the alcohol-chloroform-ether mixture would be preferable to chloroform.

In the early history of obstetric anæsthesia its adherents were compelled to meet the charge that insanity was caused by it. Until time gave experience it was difficult to prove the falsity of the charge. Puerperal insanity, like hemorrhage, had always occurred after labor in a certain proportion of cases, and might be attributed to anything done or left undone. Attention has, then, been directed to this point, and long and careful observation has failed to show any relation between the administration of anæsthetics and the occurrence of insanity after labor. All authorities are in agreement upon this point. Recently, however, attention has been again directed to the influence of anæsthetics in causing insanity. In an address to the psychological section of the British Medical Association in 1884, Dr. George H. Savage said: "Recently I have seen two persons, who were sane when put under chloroform, awake maniacal and remain insane for weeks." Again, in 1887, before the same section of the same society, the same gentleman read a paper on "Insanity following the Use of Anæsthetics."[1] After stating that anything which caused delirium, such as fever, alcoholism, belladonna, might reawaken insanity in one who had already suffered from it, he says: "Chloroform given to a patient recovering from mania might redevelop his mania. Chloroform given to a patient recovered for two years started a fresh attack of mania. An old man who was operated upon under ether remained in a silly, demented state for some weeks, and recovered as suddenly as he became ill. A lady of neurotic type developed acute delirious mania after the administration of nitrous oxide."

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[1] *Brit. Med. Journ.*, Sept. 3, 1887, p. 507. Published in full in the same journal, Dec. 3, 1887.

The debate upon this paper, conducted by the best alienists of Great Britain, developed very little support to Dr. Savage's views and furnished very few facts. Dr. Fiske had seen a case of insanity after taking nitrous oxide when it was fashionable to do so, and the patient remained insane all his life. Dr. Ashe had known a case in which "puerperal insanity had occurred in a primipara, chloroform not having been given; whereas in several subsequent confinements chloroform had been used to a considerable extent, but the puerperal insanity had never again made its appearance." Dr. Savage also made the admission that "after some cases of labor without special complication, in which chloroform was given, insanity had occurred, though other deliveries before and after had been free from any such complication. In most of his cases inherited or acquired neurosis was present."

While no testimony has been adduced to show that the administration of anaesthetics increases the occurrence of puerperal insanity, the possibility of an etiological relation between the two, especially in neurotic subjects, should be borne in mind by the obstetrician, and it would be well to consider a previous attack of insanity as a contraindication to the administration of chloroform as an analgesic.

CHLORAL.

The physiological effects of chloral are strikingly similar to those of chloroform. Locally, it is an active irritant; in strong solutions vesicant, or even escharotic. It is also decidedly antiseptic. Taken internally, its first effect is a local one on the stomach; then follows a stage of exhilaration similar to that caused by alcoholic drinks; after this comes sleep, and then narcotism. Its action may be divided into three periods: 1, excitement; 2, hypnotism; 3, stupor. Preceding or attending the second and third stages, it exerts a decided anæsthetic action, very much diminishing any pain which may be present, but scarcely ever abolishing it. Chloral causes also marked muscular relaxation, reduces the temperature, and enfeebles the contractions of the heart. It is introduced into the system by the *primæ viæ*, differing in this respect from chloroform, and differing from that agent also in its effect upon the conjunctiva, producing insensibility of that membrane long before that of the skin is affected—"an unique exception, thus far, in the history of intoxications." In poisonous doses death is by cessation of the heart's action, the ventricles enormously distended, and the evidences of gastritis present.[1]

So similar are the physiological effects of chloroform and chloral that Liebreich, the introducer of the latter to therapeutics, formulated a chemical theory of its action, according to which chloral undergoes decomposition in the blood; chloroform is liberated and becomes the efficient agent. The theory has not been accepted. Eminent men have declared themselves in favor of Liebreich's views,[1] while others equally eminent have maintained that chloral produces its effects in its original form: "chemists and vivisectors on one side, *cliniciens* on the other."[2]

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[1] Gubler: *Commentaires thérapeutiques*, 3d ed., 1884, p. 614.

Chloral was introduced to therapeutics in 1869. In the same year it was first used in obstetrics by Simpson, who found that while the patient was so deeply hypnotized by it as to be only partially aware that labor was going on, the uterus still continued to contract strongly and regularly.[3] Lambert of Edinburgh followed with a very full report of 11 cases, and conclusions on the action of the remedy derived therefrom, to which very little need be added at this day.[4] DaCunha also reported 3 cases well illustrating its beneficial effects.[5] In 1874, Dr. Playfair presented the claims of chloral to the profession, and has ever since been a strong advocate of its use. He urged its especial value in women of a highly-organized nervous type, primiparæ, and in whom dilatation of the os took place slowly and painfully. In such cases dilatation was promoted and relief rendered without the disadvantage of suspending labor, as is the case when morphia is administered.[6]

Pelissier presented some experience with the remedy in the same year,[7] and two years later published quite an elaborate paper.[8] He bore witness to the value of chloral in great sensitiveness and rigidity of the cervix, and to its power to calm suffering. His conclusion was that "if chloral lessens the pains of parturition, it acts at the same time on muscular structure, the action of which is first slowed, then arrested. It may be used to moderate excessive sensibility, but should not be resorted to in natural labor." Of 18 cases, 5 demanded the forceps. An explanation of his facts and his judgment may probably be found in the dose administered. This was always from two to three grammes, and in four cases the amount given reached seven grammes.

Chouppe's experience seems to have been as large as Pelissier's, but differed entirely as to the effect of the remedy on the uterine contractions. At the same time he counselled doses large enough to ensure effects, amounting sometimes to four or six grammes. He stated positively that the uterine contractions lose nothing in force or frequency by its anæsthetic action, while it was especially beneficial in hysterical and excitable women who had lost strength and courage by the suffering and duration of the first stage of labor.[1]

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[1] Richardson: *Med. Times and Gaz.*, Nov. 6, 1869.

[2] Gubler: *op. cit.* The student will find here the authorities on each side of the question and the chemical and clinical reasons for rejection of Liebreich's theory.

[3] *Med. Times and Gaz.*, Jan. 1, 1870, p. 4.

[4] *Edin. Med. Journ.*, Aug., 1870.

[5] *London Lancet*, Sept. 24, 1870.

[6] *Ibid.*, Feb. 21, 1874.

[7] *Le Progrès médical*, May 9, 1874.

[8] *L'Union médicale*, April 15, 1876.

Chiarleoni of Milan gave in 1875 the results of his administration of chloral. He had found it particularly useful in nervous, intractable, or discouraged patients, efficacious in relieving pain, not interfering with uterine contractions, and having no deleterious effect upon mother or child. He also showed the value of the remedy in the treatment or warding off of puerperal convulsions.[2]

In this country the first case reported of the use of chloral in labor was by DuHamel, and occurred in September, 1870.[3] Another case took place under the care of Dr. Chapman of Maryland in November, 1874,[4] and a paper appeared soon after by Dr. Prentiss of Missouri giving the results of his experience with the remedy.[5] He had found it soothing to the nervous system of patients, while it ameliorated suffering, promoted relaxation of the os, and shortened the duration of labor. Prof. Richardson of Boston during the same year gave the results of his observation in the Lying-in Hospital.[6] He reported beneficial effects of chloral in the obstinate vomiting of pregnancy, in labor, and in puerperal convulsions. Dr. Frazier of Illinois strongly recommended it to the profession, based upon his own experience.[7] An elaborate paper appeared in 1881 from the pen of Dr. Kane of New York, in which are given the opinions and experience of a large number of practitioners of this country.[8]

A careful survey of the authorities upon the use of chloral in labor shows a striking absence of that disagreement as to facts regarding its action which is the case with chloroform. Interference with the process of parturition was no longer a novel thing when chloral came under observation; moreover, the effect of chloral does not vary so widely with the dose, and especially it does not vary so rapidly as with chloroform. Whatever the explanation, there is a general unanimity of testimony as to the effect of chloral upon the various elements and processes of parturition.

1. It is a quieter of nervous agitation, a stimulant for mental despondency, a soother of irritability, and a tolerably efficient remedy for hysterical manifestations.

2. Its anæsthetic power is decided and considerable. Nevertheless, it cannot rival chloroform in its absolute power over pain. The sufferings of labor are lessened, but unconscious delivery can scarcely take

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[1] *Annales de Gynécologie*, 1875; *Am. Journ. Med. Sci.*, Oct., 1875, p. 562.

[2] *Am. Journ. Med. Sci.*, July, 1875, p. 271, from *Med. Times and Gaz.*

[3] *Am. Journ. Med. Sci.*, Oct., 1870, p. 574.

[4] *Ibid.*, July, 1875, p. 278.

[5] *Ibid.*, Jan., 1876, p. 298.

[6] *Trans. Am. Gyn. Soc.*, vol. i.

[7] *Am. Journ. Obstet.*, ix. p. 402.

[8] *Ibid.*, xiv. No. 2.

place. It has not succeeded in establishing itself in surgery as an anæsthetic.

3. Its effect upon uterine contractions is, like chloroform, regulating and tending to restore them to the normal type when they are spasmodic or irregular. In such cases it may seem to increase uterine action. Pelissier, as already shown, stated that it diminished the pains; and Pinard, from clinical study, believes that it enfeebles rather than reinforces them;[1] but all other observers agree that uterine action is not lessened by chloral.

4. The strongest and most abundant testimony is in regard to the influence of chloral in promoting dilatation of the os. It seems specially adapted for cases of thin and rigid os, when the pains are more irritating than effective.

5. Muscular relaxation being a pronounced physiological effect of chloral, it would be expected to promote the passage of the head over the perineum. There is a singular absence of testimony upon this point. Labbé, a very high authority, says that its promotion of relaxation of the perineum is not proven.[2]

The period of labor and the class of cases best adapted to the action of chloral are evident from what has preceded. Its anæsthetic and relaxing effects make it especially useful in the earlier stages of labor, and in primiparæ with whom dilatation takes place slowly. In cases in which dilatation is slow or unusually painful, in which the pains are irregular or spasmodic, the benefits of this anæsthetic are as incontestable as advantageous. For the concluding portion of labor, however, when expulsive power is active, and especially for the passage of the head through the vulva, chloroform is preferable, as the surgical degree of anæsthesia is often required.[3] The administration of chloral does not interfere with the use of chloroform at a later stage.

In giving chloral its irritating qualities must be kept in mind. Administered by the stomach, it should be well diluted; if by the rectum, the vehicle should be bland. Fifteen grains, or one gramme, may be given in an ounce of water, and repeated in twenty minutes, and again in forty minutes if necessary. By enema a scruple to half a drachm may be administered in a mixture of milk and yolk of egg or in mucilage of slippery elm. Gubler says that chloral in suppositories will speedily cause irritation of the rectum. In repeating the doses of chloral the fact should be borne in mind that once given its action has passed beyond control; it presents in this respect a marked contrast to chloroform, with which cessation of inhalation causes very speedy cessation of effects. Chloral is perfectly safe, however, with reasonable care.

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[1] Gubler: *op. cit.*, p. 625.

[2] *Dict. encyc.*, 1e Series, t. xvi., art. "Chloral."

[3] Charpentier: *Traité pratique des Accouchements*, t. i. p. 476, Paris, 1883.

While death has resulted from a dose of one drachm,[1] enormous quantities have been taken and followed by recovery, even six hundred grains.[2]

But one case of death is known to have occurred from chloral in obstetric practice. The patient was a multipara, stout and healthy; labor at seven and a half months. Fifteen grains were given every fifteen minutes, repeated four times, then twenty grains after fifteen minutes more, making eighty grains in seventy-five minutes. Deep narcotism, with stertorous breathing and feeble pulse, followed. Seven hours afterward respirations five per minute, and five hours later still temperature 103° Fahr. Delivery of dead child about eighteen hours after administration of the chloral. Death about twenty-four hours after delivery, consciousness having been partially regained. The exceedingly infrequent respiration and the temperature seem to indicate that death was not caused alone by the chloral.[3]

The contraindications to the use of chloral are the existence of diseases of the stomach and of the heart. The former would certainly be aggravated, and in the latter chloral is decidedly dangerous. In all organic affections of the heart it should not be administered, and Gubler counsels abstaining from it even in functional diseases. So marked is the injurious effect of chloral in this class of cases that the practitioner should always inform himself of the condition of the organ before resorting to it.

BROMIDE OF ETHYL.

The history of bromide of ethyl as a surgical anæsthetic is a checkered one. Used first by Nunnely of Leeds in 1849, and championed by him before the British Medical Association in 1865 with a very considerable experience, it was not accepted and was soon forgotten. In 1879 it was again brought before the British Medical Association by Dr. Turnbull of Philadelphia, who was not aware of Nunnely's former use of it. Its claims were also advocated by him in this country,[4] and by Dr. Levis, also of Philadelphia.[5] Dr. Connor of Cincinnati published 7 cases with satisfactory results.[6] Based upon these favorable reports, it began to be considerably used until the occurrence of two deaths from it checked its progress, and the publication of H. C. Wood's experiments upon dogs with it[7] may be said to have given it the *coup-de-grâce*. Nevertheless, its use as an anæsthetic in surgery was again revived by Dr. Chisholm[1] of Baltimore and by Dr. Prince of Illinois.[2]

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[1] *Brit. Med. Journ.*, March 8, 1884. [2] *Am. Journ. Med. Sci.*, April, 1871, p. 595.

[3] Full report of the case in Dr. Kane's paper, *Am. Journ. Obstet.*, vol. xiv.

[4] *Philada. Med. and Surg. Reporter*, March 6, 1880.

[5] *Philada. Med. Times*, Jan. 17, 1880. [6] *Lancet and Clinic*, April, 1880.

[7] *Philada. Med. Times*, April 24, 1880. [8] *Brit. Med. Journ.*, March 1, 1884.

In obstetrics bromide of ethyl was first used by Dr. Turnbull and Dr. H. Augustus Wilson of Philadelphia in 1880.[3] In 1882, Lebert published details of 4 cases in which he had administered it—one case of version, one forceps delivery, and two normal labors—and noted the suddenness of its effects and the rapidity of their disappearance. Further experience was published by Wiedemann and Müller. This experience was presented to the profession of this country by Dr. Montgomery of Philadelphia, who in an elaborate paper ably advocated this anæsthetic in obstetrics, and presented his own experience of 29 cases, and that of others, amounting in all to 112 cases.[4]

The action of bromide of ethyl when inhaled is exceedingly rapid; its effects pass off with equal rapidity, and it is very pleasant. In all these points it exceeds even chloroform. These characteristics admirably fit it for obstetric practice, and for labor it would be the anæsthetic *par excellence* if safe. That it is not safe is the most positive conviction of the writer. This conviction is based on—1. Experiment with animals: Wood found a marked depressing effect upon the circulation; Berger saw animals die under its influence "with a rapidity never seen with any other anæsthetic."[5] 2. Experience: the number of deaths from it show an enormous mortality compared with ether and chloroform when the relative number of administrations is considered. 3. Personal trial: the writer inhaled it three times to complete unconsciousness, and while he can testify to its pleasantness, its wonderful rapidity of action, and like rapidity of recovery, the action of the heart showed such perturbations under its influence that he could never decide to administer this anæsthetic or counsel others to do so.[6]

COCAINE.

The anæsthetic powers of cocaine have been tried to mitigate the pains of labor. Doléris of Paris was the first to publish his observations in January, 1885. Of 9 cases, very considerable relief was afforded in 6 by the application of a 4 per cent. solution to the vulva and vagina. He was followed by Dahles and others. Since then the local effects of cocaine have been tried by a number of practitioners. They differ widely. Some have believed that they found very decided amelioration of suffering;[1] others have obtained only negative results;[2] and others, again, deny all influence to the agent.[3] The results seem to differ in the hands of the same person. Thus, Fischel reports of 5 cases, 1 painless, 2 alleviated, and 2 without effect.[4] One observer, who reported "considerable mitigation of pain" with a 12 per cent. solution, afterward found equally good effects from a 4 per cent.[5]

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[1] *Maryland Med. Journ.*, Dec. 5, 1880; *Philada. Med. News*, Jan. 27, 1883.

[2] *St. Louis Med. Journ.*, 1883.

[3] *Am. Journ. Obst*, vol. xviii. p. 1217.

[4] *Ibid.*, vol. xviii. p. 561.

[5] *Brit. Med. Journ.*, May 29. 1880.

[6] *Cincinnati Lancet and Clinic*, April 10, 1880; *Brit. Med. Journ.*, April 26, 1884; *Philada. Med. News*, March 17, 1883.

The following references may prove of service to the student:

Lebert: *Des Accouchements sans Douleur par l'Emploi du Bromure d'Ethyle*, Paris, 1882.

Wiedemann: *St. Petersburg med. Wochenschrift*, 1883, No. 11.

Häckerman: *Berlin klin. Wochenschrift*, 1883.

Müller: *Ibid.*, No. 44, and *Archiv für Gyn.*, Bd. xxii. H. 1, p. 99.

Ducasse: *Essai sur l'Emploi du Bromure d'Ethyle, etc.*, Paris, 1883.

The mode of application has been by solution or ointment applied to the cervix and vulva. In private practice it is doubtful if patients would generally permit application to the former, as it could only be efficiently done with a speculum.

There are no contraindications to the local use of cocaine; the application is perfectly safe; no constitutional effects have thus far been recorded.

That a local anæsthetic the effects of which are so nearly limited to the surface should prove efficient in mitigating the pains of labor does not seem probable. The origin of the suffering is too deep and its extent too widespread to be controlled by any outward application. There is no doubt it can mitigate some portion of the suffering depending upon stretching and tearing of the soft parts, and in the absence of more powerful and more reliable anæsthetics would prove a valuable resource. The obstetrician should carry a vial of the solution in his case. If suture of the perineum should be necessary, it will render valuable service.

THE USE OF ETHER IN OBSTETRIC PRACTICE.

By the Editor.

In those portions of this country where ether is the sole anæsthetic used for surgical purposes, it is very apt to be the agent employed not only to produce the deep anæsthesia necessary for most of the obstetrical operations, but also as an analgesic to mitigate the pains of labor. This is natural enough, for the student in many of the Eastern colleges may complete his whole medical course without once seeing chloroform narcosis: he is told by the professors of surgery and of therapeutics[6] that chloroform is a dangerous substance, while ether is perfectly safe;[1] he frequently sees ether administered in the clinics, and perhaps as an advanced student administers it himself; so that it is little wonder that one so educated should choose in his subsequent practice, whether obstetrical or surgical, that anæsthetic agent with which he is familiar, instead of another against which he has been warned, with the mode of administration of which he is unfamiliar, and of the effects of which he is practically ignorant. And, moreover, ether will be found most satisfactory to the obstetrician if used with skill and judgment. It is astonishing how little of this anæsthetic is needed to secure the desired effect if the administrator is experienced in its use and endeavors to employ it as sparingly as possible—an object always to be aimed at, for the sick headache, the intense nausea and vomiting, and the irritation of the air-passages which follow a careless and profuse use of ether can all be avoided if care is exercised, in its administration, to give only so much as will produce the degree of anæsthesia that is desired.

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[1] B. C. Hirst: *Philada. Med. News*, Oct 30, 1886. [2] Parvin: *Obstetrics*.

[3] Partridge: *N. Y. Med. Record*, July 10, 1886.

[4] *Philada. Med. News*, May 22, 1886. [5] *Brit. Med. Journ.*, 1885, ii. pp. 473, 1159.

[6] "So dangerous is chloroform, and so safe is ether, that there is no excuse for the use of the former agent under ordinary circumstances" (Wood's *Therapeutics*, 3d ed., p. 283)—a dogmatic assertion that is scarcely justified in view of the fact that by far the larger portion of the civilized world uses chloroform exclusively as an anæsthetic.

The influence of ether upon the duration of labor, upon the uterine contractions, and upon the maternal soft parts is not materially different from that of chloroform, so clearly set forth by Dr. Reeve.

There are, however, certain minor points of difference which deserve consideration, while the mode of administration differs considerably. In regard to the influence of ether upon the duration of labor, one can with this remedy blow both hot and cold. In those cases, especially in primiparæ, in which the women are exhausted from prolonged effort, so that not only do the abdominal muscles fail to supplement the contractions of the uterus, but the uterine muscle itself grows weak from fatigue, ether, being one of the best diffusible stimulants, will often reawaken with renewed vigor the muscles engaged in the expulsion of the child, so that the administration of this anæsthetic will not infrequently obviate the necessity of instrumental delivery. Again, in those cases in which, during the second stage of labor, each expulsive effort causes such pain that the action of the abdominal muscles is inhibited, a mitigation of the suffering by the administration of any analgesic will result in the active co-operation of the abdominal muscles, and consequently a more speedy termination of labor. On the other hand, in those women who from excitement and pain are stimulated to a degree of frenzy in which, regardless of the pain they inflict upon themselves and deaf to the expostulations of the medical attendant, they summon every atom of muscular force at their command to terminate their intolerable suffering, any anæsthetic will calm the excitement and allow the labor to take a more natural and placid course. But in any case, ether, like chloroform, if pushed to an extreme degree, will diminish the contractile power of all the muscles, and thus not only retard labor, but predispose to post-partum hemorrhage. In those cases in which the suffering can be borne without much complaint, or in which the pain is not too great to interfere with the proper degree of muscular action, or when the labor is not too prolonged, it is, in the writer's opinion, better to dispense with an anæsthetic altogether.

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[1] As a student, as an interne in several large hospitals, and formerly as the official anæsthetizer for a considerable time in the Hospital of the University of Pennsylvania, I have had some experience in the use of ether as a surgical anæsthetic, as well as in its employment in obstetric practice; and while it is true that ether requires less care and watchfulness in its administration than chloroform, yet the idea that the former agent is entirely safe is altogether erroneous. Quite recently, during a difficult breech extraction, I nearly lost a patient from ether asphyxia. She had stopped breathing, her pulse was thirty to the minute, her face had passed from cyanosis to the ashy hue of death. It was only after the vigorous application of artificial respiration for more than half an hour that the patient partially recovered, while her condition gave me great anxiety for several hours. The administration of the ether had in this case been entrusted to a skilled nurse.

Method of Administration.—After trying the familiar cone and various forms of inhalers, all more or less complicated, I have found most convenient and suitable a rather thin towel or napkin folded once and laid lightly over the patient's nose and mouth. The ether is dropped upon the compress, only by three or four drops at a time, at the close of every expiratory act, directly below the point of the patient's nose. In this way none of the vapor is driven away from the nose and mouth by the expired air, but all of it enters the lungs at the next inspiration, and the individual is in a few seconds—in my own case after two deep inspirations—irresponsive to a sharp pinch or the prick of a knife. I believe, from experiments upon myself, that analgesia is more quickly produced by ether than by chloroform, although unconsciousness and surgical anæsthesia more quickly follow the administration of the latter. Narcosis once established by ether, it is sufficient to let fall only a drop or two directly beneath the nose at about every alternate inspiration, in order to keep the patient unconscious and insensible. If this course is pursued, there will not be the stertorous breathing, frothing mouth, and deeply-congested face only too familiar in many of the surgical clinics where ether is habitually administered. If ether is given as an analgesic to mitigate the labor-pains—and for this purpose I believe it to be superior to chloroform—it should be administered, of course, just as the pains come on, while in the intervals the administration may be discontinued. Satisfactory as ether is under ordinary circumstances, there are certain cases in which chloroform must be preferred. In eclampsia, as it is necessary to speedily secure muscular relaxation, and as it is important to avoid the high arterial tension and cerebral congestion that always follow the administration of ether, chloroform should be the anæsthetic employed. In cases of renal disease without eclamptic seizures ether is not safe, nor is it wise to use it if there is congestion or inflammation of the air-passages. When there is reason to suspect an atheromatous condition of the arteries of the brain, the danger of precipitating an apoplectic attack by the use of ether must be borne in mind.[1] In any case, moreover, in which an anæsthetic is to be used continuously for a long time, chloroform will answer better, for ether, like all stimulants, if used too long or pushed too far, becomes a profound depressant. In the clinic of the late Professor Schroeder of Berlin, and in the Frauenklinik at Munich under Professor Winckel, I have seen chloroform used continuously for many hours in cases of eclampsia, with apparently no ill effect. Aside from the positive dangers of a prolonged use of ether, a disagreeable after-effect — not, I believe, generally referred to — is a delay in the establishment of the milk secretion of from twenty-four to forty-eight hours beyond the usual time for that occurrence. This has been often forced upon my notice, and it has seemed, moreover, in these cases that the first supply of milk disagrees with the infant, which is apt to be peevish and colicky during the first week.

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[1] See "A Death during, and a Death before, the Administration of Ether," D. Hayes Agnew, *Med. News*, Nov. 19, 1887. The death during the administration of ether was caused by the rupture of an atheromatous artery in the floor of the fourth ventricle.

ANOMALIES OF THE FORCES IN LABOR.

By THEOPHILUS PARVIN, M. D., LL.D.,

PHILADELPHIA.

ANOMALIES OF THE EXPULSIVE FORCES.

THE forces concerned in birth are manifested by uterine and abdominal contractions. Considering labor as divided into three stages, in the first of these the uterine force only is active, and it has therefore been termed the uterine period; but in the second the uterine action is assisted by contractions of the abdominal muscles, and hence this period is utero-abdominal; while in the third stage the action of the uterus is chiefly, in some cases exclusively, concerned.

The anomalies of force may be manifested in any one of these periods, and, as the consequences vary with the time of manifestation, it is necessary to consider them in each stage.

In the first stage of labor uterine action may be excessive, defective, or perverted, or may be attended with very great suffering.

First: Intensity of Uterine Action.—The uterine contractions are regular, frequent, and attended with rapid progress of the labor; indeed, the progress may be so accelerated that what the old obstetricians called precipitate birth occurs if the intensity of action continues in the second stage. If the soft parts present abnormal, or in some cases even normal, resistance, they may be torn by the violent uterine action, and hence injuries to the vagina, vulva, or perineum. Or, again, the child may be expelled while the woman is standing, and rupture of the cord or sudden dragging out of the placenta, or even inversion of the uterus, result, the child falling upon the floor. It is remarkable that serious injury to the infant has seldom been observed under these circumstances, and the explanation that has been suggested is that the force of the fall is broken by the mother's limbs and by the cord.

Even though all these dangers are escaped, the sudden emptying of the uterus may be followed by relaxation of the organ, resulting in hemorrhage. Further, this hemorrhage may be absent, but failure of uterine contraction, closing the blood-vessels corresponding with the placental site, thus causing a normal relative anæmia of the organ, may lead to unusually prolonged and severe after-pains.

In the second stage of labor there is usually associated with very vigorous uterine contractions a corresponding intensity of the action of the abdominal muscles. If this violent action of labor-forces is manifested, the obstetrician endeavors to guard against the possible dangers of abrupt delivery, and also seeks to lessen excessive force. The woman lies as nearly horizontally as possible, objects against which she can press with her feet or those that she can grasp with her hands being removed; she is urged to keep her mouth open and to refrain from all bearing down. It may be necessary besides to use morphia hypodermically or to give chloroform by inhalation. The exit of the presenting part is retarded by the hand until the vulvar orifice is sufficiently dilated to permit that exit without causing injury; some have advised for this retardation the use of the forceps; retraction of the uterus during and immediately after the expulsion of the child is secured by suitable application of the hand upon the organ through the abdominal wall—"following down the womb," as expressed by the Dublin school—and slightly compressing the organ, ready to increase that compression should its relaxation occur.

Feebleness of Uterine Action.—This may be manifested in the first, in the second, or in the third stage of labor; it may vary from weak and widely-separated uterine contractions in the first or in the second stage of labor to inertia in the latter, or to complete atony in the third stage. Prior to complete dilatation of the mouth of the womb feeble contractions may be observed either before or after the rupture of the membranes. Such defective uterine action may have characterized the labor from the beginning, or may not have manifested itself until after hours of vigorous but unproductive uterine contractions.

The causes of defective uterine action are many. It may be the consequence of general feebleness, as from protracted and exhausting disease, or the muscular tissue of the uterus may not be perfectly developed; hemorrhages may have resulted in not only general weakness of all the muscles, but also in those of the uterus. Very great distension of the uterus, as from plural pregnancy or from polyhydramnios, may cause such stretching of the muscular fibres that they cannot contract efficiently. Unfavorable positions of the uterus, as from excessive obliquity or from extreme anteversion, may be attended with weak action of the organ. The same fact may be observed in unfavorable fœtal presentations: as so clearly presented by Depaul, there is a certain physiognomy of labor corresponding with the presentation; for example, if the vertex descends first, it by uniform pressure upon all parts of the cervical ring evokes stronger uterine contractions, and more frequent than if the breech presents, because the latter is illy adapted to the space and cannot exert uniform pressure; hence the labor in the latter presentation is more protracted than in the former—may become, indeed, "tedious." The condition of adjacent reservoirs—that is, the rectum and the bladder—may lessen uterine action; thus, if these organs are full the progress of the labor may be slow, while it is quickened when they are emptied. A high temperature lessens force, and hence the importance of having the room occupied by the parturient not only well ventilated, but kept cool.

Finally, the condition of the mind exercises an important influence in some cases upon uterine contractions. All obstetricians are familiar with the fact that the pains of labor, hitherto quite active, may be arrested by the entrance into the room of an unexpected professional attendant; and thus uterine action, which is independent of the will, may be at once stopped by any strong emotion, such as surprise or disappointment. It sometimes also happens that the presence in her room of some one who may be disagreeable to or disliked by the parturient, causes uterine action to become feeble or irregular. The obstetrician wise to discover such source of disorder, and with sufficient resolution and tact to have the unconsciously offending party withdraw, will be rewarded by seeing a most favorable change in the character of the labor: the personal antipathies as well as the sympathies of a woman in labor should be considered, and such action taken as will avert the former and respect the latter.

La Motte[1] has given a very graphic account of his having been called to a certain marquise who was in labor, and finding upon examination that the "infant was well placed, the bag of waters formed, and the membranes ready to open at the first pain, I thought she would soon be delivered, not only because of these almost certain signs, but also because of her great complaints, her violent movements, and by her impatience and almost continual agitation—this which experience can tell better than one can describe." But, he adds, this state "changed almost as soon as she was placed on the bed for delivery, from the fear that my eyes as well as my hands would be used in delivering her. A lady who was present, and to whom she made known her anxiety, assuring her that she was mistaken, the pains returned even with greater vigor, and in a short time labor ended."

This wise accoucheur also mentions an instance of a woman being in active labor which was at once suspended by the coming in of one of her neighbors, who insisted upon offering her undesired services. La Motte, apparently intuitively recognizing the cause of the arrest of labor, kindly invited the visitor to go and lie down, promising to call her when she was needed. Her leaving the room was followed by immediate return of uterine contractions, and the labor was speedily ended.

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[1] *Traité des Accouchemens*, 1726.

The depressing influence of deep grief or of great fear may be manifest in feeble uterine action. In such cases the obstetrician endeavors to evoke an antagonistic emotion or sentiment; he seeks to inspire the timorous with hope, and the sorrow-stricken, if not with joyful anticipations, at least with resolute will and obedience to the demands of duty.

The fact of the fœtus being dead has been thought by some to protract the labor, because the living fœtus by its movements is claimed to irritate the uterus and thus increase its activity.

Idiosyncrasy is alleged by some to be manifested by want of efficient uterine contractions, and thus some women always have tedious labors, unexplained by any pelvic deformity. It is, however, probable that these cases of supposed idiosyncrasy as the cause of feeble uterine contractions, would upon sufficient examination be found dependent upon imperfect development of the muscular tissue of the uterus.

The diagnosis of inefficient uterine contractions rests chiefly upon the slow progress of the labor or upon its arrest. Moreover, the contractions are separated by wider intervals than normal, and each contraction seems to stop before attaining natural intensity. The following passage from Zweifel[1] will assist in providing against a dangerous mistake in some cases of apparently weak labor-pains:

"In abnormal relations of space, especially in contracted pelvis and in a rigid, unyielding os uteri, weak labor-pains have a very different signification. One should believe that after the definition of weak labor-pains—the uterine contractions occur at distant intervals, are too short, and do not attain the general intensity as to the hardness of the musculature—there could not exist any difference of opinion, and especially no oversight. We have already briefly referred to the fact that it is necessary to make thorough examination of the entire uterus if one will avoid false conclusions; and to enforce this I adduce an experience in the case of a young primipara with greatly contracted pelvis, in regard to whom two physicians held an entirely different opinion as to the labor-pains. One asserted that no regular pains were present, while the other maintained that it was a case of so-called uterine tetanus, and that the uterus was almost continually contracted. Both always examined for a contraction of the uterus, but one placed his hand upon the pubic region, and the other upon the fundus of the uterus. When I arrived I found the contraction-ring had ascended halfway to the umbilicus. The lower portion of the uterus extending down to the pubic symphysis was bladder-like and felt like a sail filled by the wind. Otherwise the furrow of the contraction-ring was not directed transversely across the abdomen, but obliquely; on the left side it was the breadth of a hand higher than on the right side; the uterine horn was situated upon the right side. The uterine fundus was very much contracted; the lower part was exceedingly thin from stretching, and near being ruptured in consequence of the labor-pain. These are conditions which we recognize and understand better from Bandl's work."

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[1] *Lehrbuch der Geburtshülfe.*

The prognosis varies in gravity according to the period in labor when this anomaly of uterine action occurs. Should slow or inefficient uterine action be manifested in the first stage of labor, the membranes being unruptured, the child suffers no harm from the delay; and even if the membranes have ruptured, it is most probable that sufficient liquor amnii remains to protect the cord and fœtus from injurious pressure, for it is well known that a part of the amniotic liquor may be discharged several days, if not some weeks, before birth, and the child then delivered living. However, it is not frequent that weak pains occur in the first stage of labor after the flow of the amniotic liquor. The prognosis, so far as the mother is concerned, is usually spoken of as favorable. Yet some qualification should be made, for an unduly prolonged first stage of labor may so exhaust the woman that her strength utterly fails in the course of the second or of the third stage, and in the latter the uterus falls into such an atonic condition that dangerous, even fatal, hemorrhage may occur.

The treatment of many of the cases of defective uterine action is in part suggested by the etiology, essentially consisting in the removal of the cause. Thus, a full bladder or rectum is to be emptied; an abnormal situation of the uterus remedied by a change in the patient's position or by the application of a bandage; if there be excessive right[1] obliquity of the uterus, for example, the woman must lie upon her left side, and Dr. Barker has even spoken of extreme anteversion in which the labor made better progress by having the woman lie not only upon her back, but also with the hips elevated; excessive distension of the uterus is to be relieved by evacuating the liquor amnii, provided the os be dilated or readily dilatable, as it usually is in case of such large expansion of its cavity.

In case of prolonged first stage of labor, the pains occurring at long intervals and accomplishing little or nothing, such condition occurring more frequently in primiparæ, the parturient deprived of sleep and becoming discouraged as well as weakened, it is often advisable to suspend uterine action and secure needed rest for her by a full dose of opium. She wakens usually after a few hours' rest refreshed, and the labor takes a normal course. In other instances of delay, taking some simple food or a warm drink—as a rule, the use of alcohol in any form is forbidden—will be followed by efficient uterine action.

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[1] Deventer not only speaks of right and left obliquity of the uterus, but also of anterior—by this meaning that which is now referred to as anteversion or anteflexion—and of posterior obliquity. The last is, of course, impossible.

If more decided means are required in the first stage of labor, the membranes being unruptured, the introduction of an aseptic bougie between the ovum and the uterine wall may be employed; still further, irrigations of hot water, continued for fifteen or twenty minutes each time, in the vagina may be used. If further interference be demanded, dilatation of the os by means of Barnes' or similar dilators may be resorted to, not merely for their direct effect in overcoming the first obstacle to the descent of the presenting part, but with the strong hope that the pressure of the dilators may evoke vigorous uterine contractions. The latter effect has been produced by some—notably by Dr. Isaac E. Taylor and the late Dr. Albert H. Smith—by introducing the forceps and bringing the head down to the os at each pain, but not making any attempt at extraction.

The employment of electricity to increase deficient uterine action has some advocates; such employment, however, can hardly become general in the profession, but it will usually be restricted to lying-in hospitals.

Should failure of uterine force come on in the second stage of labor, possibly uterine contraction may be excited by friction made upon the fundus of the uterus, or assisted by uterine compression according to the method known as Kristeller's. Some have thought that uterine contractions are increased in force by quinine; for example, three doses of six grains at intervals of twenty minutes. The medicine will do no harm, but quite frequently is not followed by any good.[1] The temptation to give ergot is often very great, but only in exceptional cases is this remedy advisable, for it may excite the uterus to a tetanic action, which carries peril to the life of the child and danger of more or less serious injury to the mother. But, for example, in a multipara, the presentation and the position of the child being favorable, its size normal, and the birth-canal ample, so that with a few vigorous pains the fœtus will be expelled, ergot may be used in small doses; for it seems probable that when such doses are given the normal uterine contractions are only made stronger, and continuous contraction, which is so perilous to mother and child, does not occur. But let it be remembered that only ten drops, for example, of the fluid extract of ergot should be administered, and then, if necessary, the dose repeated at intervals of fifteen minutes, until thirty, or at most forty, drops have been administered. In case there are objections to the use of ergot, delivery by the forceps, or in some cases in which the head is not in the pelvic cavity by podalic version, will be indicated.

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[1] "Whatever action has been observed from cannabis indica, quinine, digitalis, and also from pilocarpine, in increasing labor-pains, is probably due to the general action of these drugs. In that case their action does not differ greatly from that of a glass of wine or a cup of coffee. In fact, we often see that anything refreshing given to the patient, who in consequence of great suffering could not eat anything for a long time, acts wonderfully, and that with this increasing strength pains are favorably influenced."—*Zweifel.*

Uterine inertia in the third stage of labor is to be guarded against by frictions and compression of the uterus through the abdominal wall, and thus spontaneous detachment and extrusion of the placenta, such removal being assisted by a *vis a tergo*, rather than effecting it by pulling upon the cord, or by a *vis a fronte*.

The subject of post-partum hemorrhage consequent upon uterine atony will be considered in another part of this paper.

Perversion of Uterine Action.—Perverted uterine action may be general or local. In the former the uterus, instead of being alternately contracted and relaxed, remains in almost continuous contraction, and is rigid, resisting, instead of at regular intervals yielding to, external touch or pressure. This condition of excessive irritability of muscular fibre may arise from abnormal resistance, as malpresentation of the fœtus, pelvic narrowing, or obstruction from tumors, or it may be the result of that meddlesome midwifery which is perpetually "touching" or striving to dilate the os with the fingers, or follow the untimely administration of ergot or from giving it in too great a quantity. To abate this violent action of the uterus the most valuable remedies are a prolonged warm bath, hypodermic injections of morphia, or opium by the stomach or rectum, or chloral and inhalation of chloroform.

Local perverted uterine action is observed most frequently in what is known as spasmodic contraction of the os uteri. The os is tense as a cord during uterine contractions, and for a time at least these seem powerless to overcome the resistance. Such condition is most frequently seen in nervous, irritable primiparæ. After a while, however, and without the interference of the practitioner, the action of the fundus and the body of the uterus becomes stronger, and the obstacle is overcome in most cases. The practitioner will refrain from frequent examinations, and he may use chloral or morphia or employ anæsthetic inhalation if the pain be great or the spasm protracted.

Partial or local spasmodic action of the uterus may occur. It has been claimed that in rare instances strong and more or less continuous contraction may affect a portion of the body of the uterus, as in the case reported by Hosmer,[1] in which there was, according to Dr. Robert P. Harris,[2] tetanoid falciform constriction of the uterus. Charles[3] states that partial spasm of the body of the uterus is not common; it is characterized, in several cases, by a rigid, hard, circular band situated toward the middle or the inferior third of the uterus, forming a furrow, a sort of constriction like "a circle of iron." Nevertheless, these contractions, read in the light of recent knowledge, would be explained as not local, but as resulting from tetanic action of the uterus, marked by great ascension of what is known as Schroeder's contraction-ring. Such condition is illustrated in the case quoted from Zweifel, and will again be mentioned in connection with rupture of the uterus.

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[1] *Boston Medical and Surgical Journal*, 1878.

[2] Note to the American edition of *Playfair*.

[3] *Cours d'Accouchements*, 1887.

Kleinwächter denies the existence of partial uterine contractions, but maintains that in consequence of the relations of its muscular fibres to each other the uterus must contract as a whole. The so-called spasmodic contraction of the external os uteri is simply a condition in which the upper part of the uterus has not manifested enough power to overcome resistance; the os is only slightly dilated, and it presents sharp edges; but as soon as the contractions have become more vigorous it opens, the so-called spasm ceasing. Again, in the third stage of labor the placenta may not be spontaneously detached in consequence of adhesions, and the uterus takes the form of an hour-glass. The relaxed lower uterine segment represents a funnel, the narrowest portion of which is above. The upper portion of the uterus contracts around the remaining placenta, and immediately below the walls of the body meet, as nothing intervenes; but the lower segment is found, as after every normal birth, in a condition of partial paralysis; that is, it is relaxed. The so-called stricture, therefore, is not a pathological manifestation, but the normal condition after the birth of the child.

Spasmodic contraction of the os uteri has been most frequently observed. This may appear in the first stage of labor, causing more or less delay, or after the expulsion of the head the os may close about the neck of the child, the body remaining imprisoned in the uterus. Finally, after the complete expulsion of the child the placenta may remain in the uterus in consequence of what has been called hour-glass contraction.

It is probable that spasmodic contraction of the external os in the first stage of labor is usually to be explained as simply failure of force of uterine contractions to overcome the normal resistance there presented. Contraction of the external os about the neck of the child, if this really occurs—and eminent obstetricians have reported cases of it[1]—may be not so much the result of action of muscular fibre as a manifestation of the force of elasticity, as will be more fully explained. Finally, as taught by Kleinwächter,[2] the so-called hour-glass contraction of the internal os uteri after the expulsion of the child, resulting in temporary imprisonment of the placenta, may be simply a normal contraction of the entire body of the uterus, while the cervical canal, also in normal condition, remains loose and relaxed.

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[1] One of the most recent authorities sustaining the view that contraction of the external os around the neck of the child, thus furnishing a serious obstacle in delivery, may occur, is Varnier, *Annales de Gynécologie*, July, 1887. He asks, "Who has not seen in pelvic presentation the external os, insufficiently dilated or dilatable, contracted, after the expulsion of the trunk, around the neck of the child, rendering extraction extremely difficult, sometimes impossible?"

[2] *Grundriss der Geburtshülfe.*

Baudelocque, Dewees, and others have described contraction of the external os and that of the internal os after the complete or partial escape of the head or body from the uterus, the neck being so closely grasped by the constricting ring that delivery is arrested: the first variety is exceedingly rare, according to the statements of those who have observed it, while the latter is comparatively frequent: Charpentier asserts that in those cases in which the neck of the child is closely encircled, as has been stated, the contraction is at the internal os.

Now, it is not improbable that if the delivery of the shoulders through the external os, the head having passed out, is arrested, the apparent retraction of the ring arises simply from elasticity, and the delay in delivery is the consequence of the great size of the shoulders and want of vigorous uterine action, just as a similar delay is sometimes seen in like conditions after the expulsion of the head from the vulvar orifice. It certainly is not necessary to accept the hypothesis of contraction of the external os.

In regard to the second form of the disorder—that is, contraction of the internal os around the neck of the child—Dewees gave this explanation: "At the latter end of gestation the neck of the uterus is entirely effaced, but no sooner is the distending cause removed than the fundus, body, and neck set about moulding themselves into their original form," etc. The explanation of to-day is that the condition is not in itself pathological, but corresponds to a general contraction of the uterine body, the internal os included: it is thus seen that there is an important correspondence between the explanation given by the father of American obstetrics nearly a century ago and that now taught.

Accepting the explanations that have been offered, it is obvious that the treatment of these various conditions of local spasmodic contractions will greatly vary. In case of contraction apparently limited to the upper portion of the uterus, and occasioning long-continued unproductive uterine efforts, immediate artificial delivery is demanded. In spasmodic resistance of the external os in the first stage, lessen the pain which is associated with the condition by the use of an opiate or anæsthetic, and wait until the contractions of the body and fundus of the uterus can overcome the resistance. In elastic contraction of the external os around the neck of the child, immediately overcome it by stretching the ring with the fingers; at the same time, friction and compression of the uterus may be used, and the woman urged to bear down strongly, so that by these combined forces the resistance may be promptly overcome and the child liberated from the constriction which imperils its life. Imprisonment of the placenta from normal general uterine contraction, the so-called hour-glass condition, will end just as soon as normal uterine relaxation follows; in case immediate interference is demanded—by hemorrhage, for example—an anæsthetic and mechanical dilatation of the constricting ring may be employed. But this topic will be fully considered in another part of this paper.

Uterine contractions may be attended with excessive pain. The cause of this very great painfulness of "pains" the old accoucheurs attributed chiefly to rheumatism of the uterus, while most recent authorities usually fail to refer to it. Charles,[1] however, states that, as all muscles, the uterus may be affected by rheumatism. "The rheumatic pain may occupy different parts of the uterine wall; it is increased by pressure, by efforts, by movements; it is rarely fixed; most frequently it changes its place, disappearing upon one side, and is manifest upon the other; diminishes at one time, increases at another, ceases and returns without apparent cause."

In some cases the suffering is the result of a local parenchymatous metritis. Thus a woman a few days or a few weeks before her labor receives a blow upon the abdomen or similar injury results from a fall, and when labor sets in the part then injured is the seat of extreme suffering.

Probably, however, in the majority of cases the cause is to be found in excessive susceptibility to suffering and great general nervous sensibility. One of the old philosophers taught that man was the measure of the universe, but there never yet has been proposed means for measuring human pain; each individual estimates its intensity for himself, for herself. And so it comes that the suffering of childbirth, which one woman endures patiently and without complaint, in another produces intolerable agony, and may exhaust nervous power so that life itself is in peril.

The treatment of excessive suffering caused by uterine contractions is, plainly, since we cannot remove the cause, blunting the sensibility, and of course this is to be accomplished by opium or morphia, by chloral, or by inhalation of ether or of chloroform.

Anomalies of abdominal contractions may be manifested by excess, by defect—that is, irregular, insufficient, incomplete—or by entire absence. These contractions are chiefly voluntary; only at the close of the second stage of labor do they seem to escape entirely or almost entirely the dominion of the will. Such contractions exerted during the first stage of labor, and usually in the second stage if not synchronous with uterine action, are worse than useless. So, too, they are spending strength for naught if exerted when some invincible obstacle, as a malpresentation of the child or obstruction of the birth-canal, prevents delivery. Finally, excessive abdominal effort may contribute to the expulsion of the child before sufficient dilatation, especially of the vulvar outlet, has been accomplished, and tears result.

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[1] *Op. cit.*, Paris, 1887.

In the treatment of excessive abdominal contractions—that is, of such voluntary efforts untimely or violently made—much may be done by instruction of the patient; that is, teaching her when effort should be made and when she should refrain: at the close of the first stage of labor, if excessive voluntary effort threatens too rapid a delivery, she is directed to take frequent respirations, and objects which her feet can press or which she can grasp are removed, and it may be necessary to employ chloroform by inhalation.

It will sometimes be found that when an anæsthetic is given during labor the patient makes voluntary bearing-down efforts in the intervals between uterine contractions, solely for the purpose of having the anæsthetic given, its administration in most cases being limited to the periods of uterine action. This occasional phase of perversion of voluntary effort is witnessed sometimes by every obstetrician who uses anæsthetics in labor.

A primipara at the beginning of the second stage of labor frequently hesitates to exert abdominal contraction, fearing that this will increase her suffering. But this disorder of relation between abdominal and uterine force soon ceases. Oftener the abdominal contraction is interrupted by frequent inspirations, and the bearing-down effort is not continuous, thus leading in some cases to considerable loss of force.[1] The pearl-diver can remain under water for a minute or a minute and a half, and this fact has its significance with reference to the time a woman in labor can contract the abdominal muscles. She ought to be urged to continue that effort as long as the corresponding uterine contraction lasts.

Naegele gives the following as the chief cause of feeble abdominal contraction, and manifestly the treatment of the disorder will chiefly consist in, so far as possible, the removal of the cause: Insufficiency of force in abdominal contractions may result from those contractions being very painful, from the great feebleness of the patient from previous diseases, exhaustion produced by inopportune or premature efforts, difficulty of respiration in consequence of obesity, from bronchocele, vices of conformation, such as deviations of the vertebral column, inflammatory and spasmodic affections of the thoracic organs, diseases of the heart, hydrothorax, ascites, etc.

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[1] J. S. Mill has said that he could conceive a condition of things in which 2 and 2 are not 4, thus apparently denying that which most would regard as the simplest mathematical certainty. The accoucheur has frequent opportunities of observing that 1 and 1 are not 2, or that 1, 1, and 1 are not 3; that is, a voluntary abdominal contraction divided into two or three parts is not equal to an unbroken, uninterrupted effort.

In case of paraplegic women the expulsion of the child is accomplished by uterine action alone, and the general rule is that in these women the labor is longer than in those not thus affected. Nevertheless, numerous exceptions to this rule have been observed. For example, during my service in the obstetric department of the Philadelphia Hospital I have had under my care two paraplegic women, and their labors were not at all protracted. It has been suggested, in explanation of similar facts, that the deficient power of abdominal contraction has a compensation in diminished resistance of soft parts.

Anomalies of the Soft Parts.

I. Anomalies of the Uterus.—(*a*) *Anomalies of Development in Intra-uterine Life or During Pregnancy.*—In uterus bicornis, the pregnancy being single, there is a greater liability to transverse presentation of the child; and it has also been observed that in some cases the unimpregnated horn has interfered with the entrance of the child into the pelvis.

Two forms of anomalous development of the uterus during pregnancy have been observed, the one involving the anterior, the other the posterior wall. The former has been seen in some cases of unreduced[1] retroflexion of the pregnant uterus; while in the majority of instances this displacement of the uterus is incompatible with the continuance of the pregnancy, in exceptional ones the pregnancy has continued to, or near to, the normal time. The posterior wall and fundus of the uterus lie in the pelvic cavity, and the enlargement of the organ is chiefly at the expense of the anterior wall. The delivery in these cases has been artificial, and presents more or less serious difficulty.[2] In that reported by Stillé[2] it was accomplished by podalic version and extraction.

Depaul[3] reported in 1876 a case in which there was a sacciform[4] dilatation of the posterior wall of the uterus. In this instance it was impossible to find the os uteri, and, believing it completely closed, Depaul made an artificial opening. The woman died undelivered, and the subjoined illustration (Fig. 270) shows the condition found upon post-mortem examination.

Hernias of the uterus are exceedingly rare, and still more seldom met with are those in which the accident complicates labor. In some of the cases of this accident replacement of the organ was possible and labor was spontaneous; in at least one instance the Cæsarean operation was performed.

Prolapse of the uterus as a complication of labor is rejected by some recent authorities, they maintaining that the condition so described by former observers was really hypertrophic elongation of the vaginal portion of the neck of the uterus. Nevertheless, as representing the view hitherto held by most authorities, the following extract from the last edition of *Cazeaux* is given :

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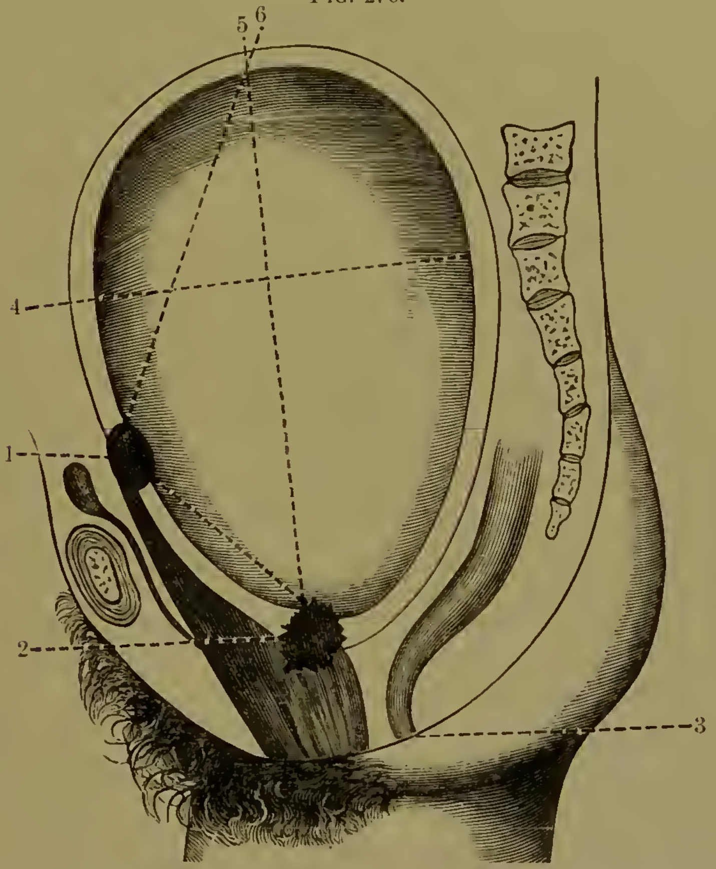
[1] *London Obstetrical Society's Transactions*, vol. i.

[2] *Memorabil.*, 1881.

[3] *Archives de Tocologie*, 1876.

[4] For a still earlier instance of such dilatation see Franke, *Monat. f. Geburts.*, 1853.

Fig. 270.



Sacciform Dilatation of the Uterus (Depaul): 1, os uteri; 2, artificial os. The distance between the two was about 3½ inches. The distance from the fundus of the uterus (6) to the os was 6.7 inches, while that extending from the same point (5) to the new opening was 9 inches. The distance from the os to the median point of the fundus was, following the curve of the anterior wall, 8.2 inches, but following the curve of the posterior wall, 18.1 inches.

“The prolapsus may prove a source of serious difficulty in the progress of the parturition, for experience has shown that this accident may not only be productive of long delays, but likewise of real danger; perhaps it may render the spontaneous expulsion of the fœtus altogether impossible, either, as has been long since remarked, because the womb, which has descended to the lowest parts of the abdominal enclosure, is removed, as it were, from the influence of the contraction of the abdominal muscles, or because, being wedged in between the surface of the child's body and the walls of the pelvis, it has lost a great part of its energy in consequence of long-continued pressure.

"The difficulties to be overcome will also vary according to whether the prolapsus be recent or of long standing; for in the latter case the prolonged contact of the organ with the internal face of the thighs and with the dress may have produced a state of induration of the cervix which opposes its steady dilatation; indeed, this has often been impossible, and the physician has been obliged to incise it to overcome the resistance offered by the indurated parts. On the contrary, where the accident has recently occurred, or, still better, if it is only manifested during labor, the dilatation is sometimes effected spontaneously and the duty of the accoucheur is limited to facilitating it by the use of appropriate means."

The statement made by the author as to the necessity of incisions of the cervix in certain cases testifies strongly in favor of hypertrophic elongation of that part demanding these incisions. Moreover, in none of the cases of alleged prolapsus of the uterus in labor is proof given that the fundus occupied other than its normal position or that any portion of the fœtus occupied the supposed prolapsed part of the organ.

Barnes states: "We have not seen a complete procidentia of the gravid uterus at term, but we have several times been called to see it. This is what we actually saw: an enormous fleshy mass protruded beyond the vulva, of a livid color, and presenting an opening—the os uteri—in its centre. On feeling the abdomen we have found at least a portion of the uterus, containing part of the fœtus, there. It was clear, then, that although the os uteri and cervix might be completely outside the vulva, the whole uterus was not." He then refers to one case to which he was called in which the condition was as represented in Fig. 103, taken from his works. That illustration, however, shows no prolapse of the uterus, but simply hypertrophic elongation of the cervix.[1]

Spiegelberg[2] recognizes prolapse of the uterus as a complication of labor, and remarks: "During the pains counter-pressure in an upward direction should be made, and the action of the abdominal muscles restrained as much as possible, since their contractions tend to increase the prolapse and incarceration of the lower segment of the uterus; indeed, it is possible for the uterus, when diminished by the discharge of the liquor amnii, to be to a great extent pushed out of the pelvis. When such is the case, as also when the mischief is less severe, delivery should be undertaken as soon as it appears at all necessary and permissible. It will of course be obvious that during the so-called third period of labor no traction must be made upon the cord; that when that stage is over the prolapse must be immediately and completely reduced; and that during the lying-in period the greatest watchfulness is necessary to keep the organs in situ."

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[1] *Obstetric Medicine and Surgery*, vol. ii. p. 549, Eng. edition.

[2] *Lehrbuch der Geburtshülfe.*

Anomalies of the Os and of the Cervix.—Occlusion of the os uteri presents two forms—the one a superficial obliteration which can be broken by the pressure of a probe or of the finger, and the other one in which the closure is not only complete, but resistant; the latter may have originated from the application of caustics or the injection into the vagina of caustic fluids during pregnancy. In the first form careful examination will reveal on some part of the hemisphere formed by the descending head enclosed in the lower segment of the uterus a depression or dimple corresponding with the normal position of the os, and the obstruction may be overcome by the means previously mentioned, subsequent artificial dilatation being, if necessary, employed. Very careful examination must be made in the second case to find the position which the os had occupied; if necessary, the hand should be passed into the vagina in making the search. The place having been found, a simple short incision is made with a convex bistoury wrapped nearly to its point with adhesive plaster; next multiple incisions are made with a probe-pointed bistoury, these incisions being about one-sixth of an inch in depth.

Rigidity of the Os Uteri.—The so-called spasmodic rigidity of the os has been considered and its appropriate treatment given, and we have now to consider an unyielding condition of the os arising from structural change caused by the formation of cicatricial tissue. In addition to this form of rigidity there may be in a case of premature labor or in an old primipara great resistance on the part of the os, so that the first stage of labor is very slow; but this organic rigidity can hardly be called a pathological condition, for in most cases the difficulty is overcome spontaneously and without either local or general injury. But it is otherwise in case of a stricture or stenosis of the os arising from the formation of cicatrices. Here one or more superficial incisions should be made, and for this purpose blunt-ended scissors may be employed. By some it is advised not to make any cut immediately anteriorly or posteriorly, lest a resulting tear may extend into the utero-vesical or into the utero-rectal cul-de-sac.

While the bleeding which follows incision of the external os in labor is usually very slight, in rare instances it has been quite severe. Thus, Laborie[1] has narrated a case of labor under the care of Dubois in which there was a face presentation, and the resistance of the os was so great that he made two incisions, one on each side; severe hemorrhage followed, so that cold-water injections failed to stop it. Immediate delivery being impossible, it was necessary to tampon the vagina: some hours afterward the woman was delivered with the forceps of a dead child. Dr. Guido Bell[2] of Indianapolis has reported a case in which incision was followed by such profuse arterial hemorrhage that ligation of the bleeding vessel was necessary.

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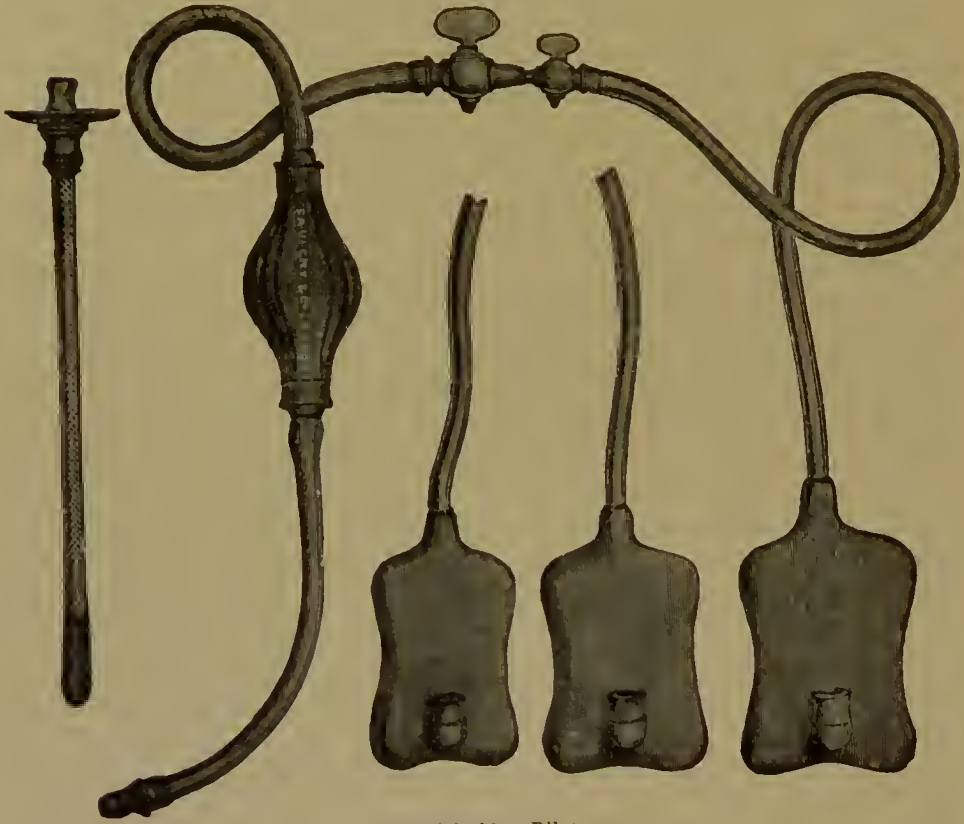
[1] *Gazette méd. de Paris*, 1846.

[2] *Memorabil.*, 1882.

Warm baths, vaginal irrigations of warm water to which an antiseptic has been added, relieving the patient's mental anxiety and securing her rest if necessary, will constitute the treatment in what has been called organic to distinguish it from cicatricial rigidity. But if some accident arises and immediate delivery is required, then artificial dilatation of the os must be employed; and for this purpose the hydrostatic rubber dilators of Barnes are to be especially recommended.

FIG. 271.



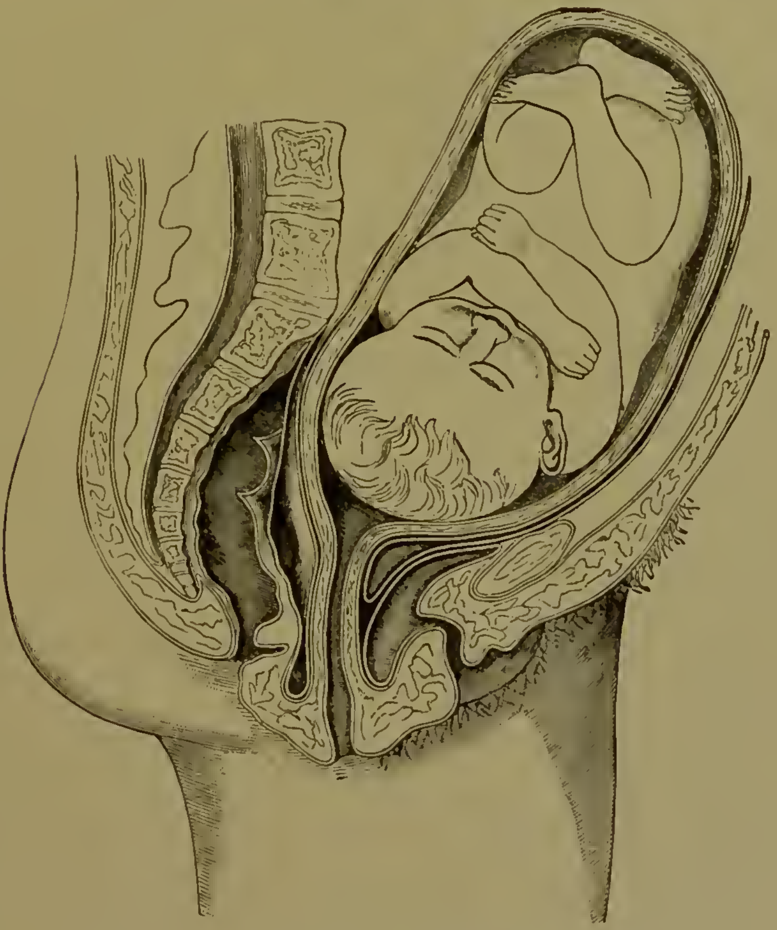
Barnes' Rubber Dilators.

Delay in dilatation of the os may be the consequence of strong adhesions between the membranes of the ovum and the lower portion of the uterus adjacent to the internal os: the remedy is rupture of the membranes.

Hypertrophic elongation of the cervix may present more or less serious obstruction to labor. The obstacle may be overcome in some cases by artificial dilatation or by this combined with incisions, so that delivery by the forceps or cephalotribe is practicable; but in others the indication for the Cæsarean operation is clearly presented.

Dr. Robert Barnes, from whom the subjoined illustration is taken, narrates a case in which the labor was impeded by an hypertrophied cervix: "A primipara, aged twenty-two, was in labor. The cervix protruded through the vulva about three inches, forming a mass equal to a man's wrist in circumference. After reducing the cervix in the vagina the head could be felt. The cervix had a hard, gristly feel. Free incisions in the os externum were made, so that the os externum was freely opened up to meet the natural expansion of the os internum. She was then delivered after an anxious labor of fifty-two hours."

FIG. 272.



Illustrating Labor with Hypertrophic Elongation of the Cervix.

Cancer of the cervix is one of the gravest complications of labor. Cohnstein's statistics show that of 126 women thus suffering, 72 died during childbirth or in the puerperal period. More recently, Stratz[1] found that in 7 cases of carcinoma complicating labor, 4 women died immediately after delivery, and 2 as a consequence of labor.

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[1] *Zeitschr. f. Geb. und Gyn.*, Bd. xii. Heft 2.

Baudelocque regarded the Cæsarean section as indicated in cases in which cancerous disease of the uterus obstructed delivery; and how much stronger the indication is in our day when this operation, properly performed, has just such a vastly lessened mortality!

The treatment, however, usually pursued is trusting largely to spontaneous dilatation, and, where required, assisting this expansion by incisions of the cervix. Dubois succeeded by cutting freely through the cancerous tissue, but if the latter be very thick, a serious hemorrhage may ensue. Most obstetricians, therefore, who advise incisions recommend that they should be made through that part of the neck, if such there be, that is not diseased. When either spontaneously or by art the os is sufficiently dilated, delivery is to be accomplished with the forceps.

One of the accidents of labor in these cases is rupture of the uterus; thus in the 60 cases collected by Chantreuil,[1] 6 women perished from rupture of the uterus. Further, as to the maternal mortality observed by him, 25 women died either during labor or in the puerperal period, and the remaining 33 either during that year or the succeeding one. 29 of the infants died, 23 were born living, and in regard to 3 no statement is given. Considering the great mortality, both fœtal and maternal, of this affection, it would be advisable to accept the teaching of Zweifel: in case the child cannot pass through the os, Cæsarean section is undoubtedly justifiable in all cases if the child be living.

Uterine myomata, whether of the body or of the cervix, complicate labor when by their size or position they interfere with the action of the uterus, obstruct the birth-canal, or prevent the dilatation of the cervix: a further complication may arise from the placenta occupying a position upon the internal wall corresponding with the position of an interstitial myoma, for the retraction of this part of the uterus being imperfect, closure of blood-vessels is incomplete and post-partum hemorrhage results.

Nevertheless, probably in a great majority of instances uterine myomata do not seriously interfere with labor nor with the normal course of the puerperal state. We may be misled by the observations made in lying-in hospitals, for probably only the graver cases have been found there. Stratz's[2] statistics show that of 13 women in whom labor was thus complicated, 7 died, and only 4 had a normal lying-in. Chabazian,[3] from the study of 310 cases of pregnancy complicated by these growths, found the proportion in which the neoplasm occupied the cervix to that in which it was seated in the body of the uterus was

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[1] *Du Cancer de l' Utérus au Point de Vue de la Conception, de la Grossesse et de l' Accouchement.*

[2] *Op. cit.*

[3] *Des fibromes du col de l'utérus au point de vue de la grossesse et de l'accouchement.*

1 to 5, while in the non-pregnant the relation is 1 to 20. The statistics show very clearly that growths involving the cervix interfere much less with conception and gestation than if otherwise situated. It is fortunate, as we shall presently see, that these neoplasms can thus in so many cases be from their situation more readily removed in case they interfere with labor.

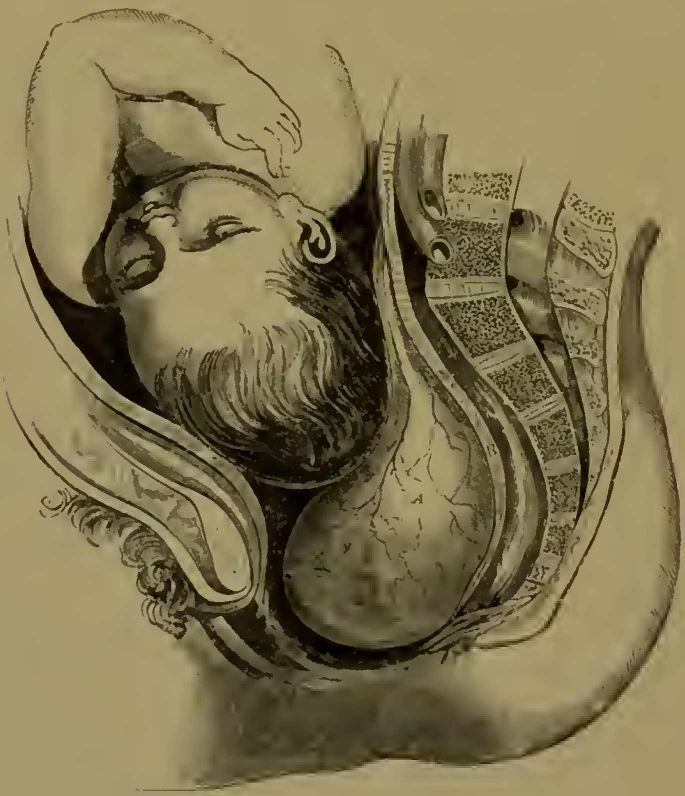
As might be expected from the uterus being deformed by the myoma, accommodation may compel an abnormal presentation; thus, the fœtus is much more frequently than in normal conditions of the womb found in a transverse position.

The general rule in the management of labor is to push the tumor out of the way if it prevents the entrance of the presenting part of the fœtus into the pelvic cavity: this pushing up the tumor has been done in some cases by having the woman in the knee-chest position. This disposition of the tumor has in some instances been accomplished, especially in case the growth had become pedunculated in the abdominal cavity. In some cases such a tumor that has fallen into Douglas' cul-de-sac can be readily thus pushed up in the abdomen, from the pedicle being quite long, one instance having been recorded in which the pedicle was twenty centimeters in length. In other instances the tumor, having become polypoid, and descending before the child, can be removed by amputating the pedicle with the écraseur, or it can be removed by enucleation if it be situated in either wall of the cervix: each of these operations has been several times successfully done during labor.

The gravest cases are those in which the tumor is interstitial, is situated in the lower portion of the uterine wall, and is so large that it is impossible for the head of the fœtus to enter the pelvic cavity. Here the decision must be made between craniotomy and the Cæsarean operation; and this decision should be made early, for either operation may end fatally from delay in its performance. If the tumor occupies the anterior uterine wall so that its incision is necessary for the removal of the child, then in addition to the Cæsarean operation myotomy must also be done, and this double operation makes the prognosis almost hopeless.

An ovarian tumor may complicate labor. The question of treatment will be determined chiefly by the size, consistence, position, and mobility of the growth. If the tumor be in the pelvis, possibly it may be pushed up into the abdominal cavity, so that the presenting part of the fœtus can descend; if immovable and cystic, puncture or incision may be necessary; but if it be solid, and thus fixed, the choice may be between the Cæsarean operation and craniotomy. Nevertheless, before opening the uterus ovariotomy should be done, and then probably the delivery can be effected through the natural passage. In case the tumor be large and abdominal, rupture of the cyst may occur or twisting of its pedicle; but rupture is not necessarily fatal, for how many instances are recorded in the non-pregnant without death! After dilatation of the os the danger of bursting of the tumor comes—that is, during the period of abdominal contractions: this danger is to be avoided by artificial delivery, and this delivery should be by the forceps rather than by version, the results when the former method was employed having been much more favorable than those obtained by the latter. It is also to be remembered that usually premature labor occurs in cases of pregnancy complicated by a large ovarian tumor.

FIG. 273.

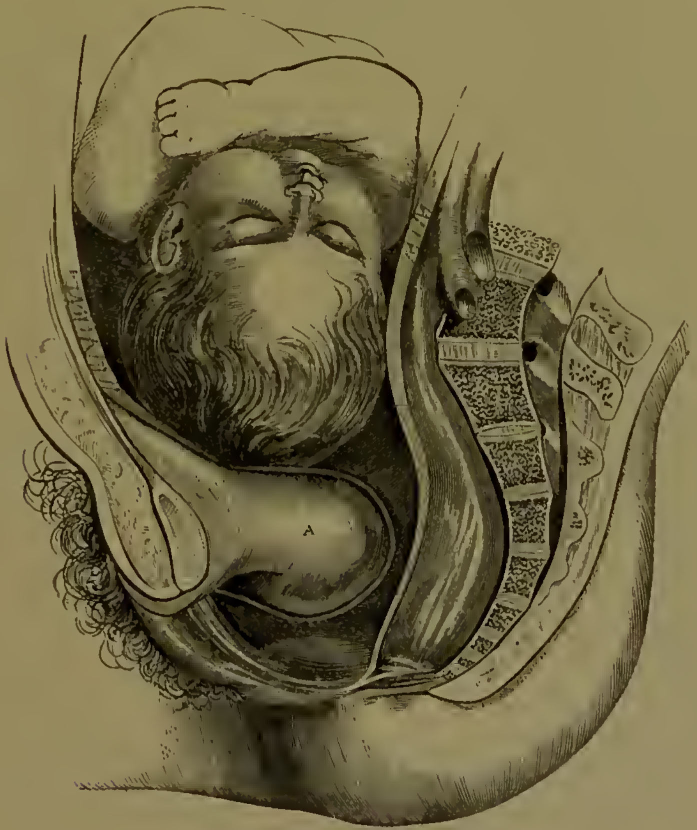


Ovarian Tumor complicating Pregnancy.

Obstruction of the vagina as a consequence of the rectum being distended with feces or the bladder with urine can only rarely occur. Ramsbotham has stated that he has seen many instances of the bladder prolapsing before the head, and mentions two in which it was punctured, one practitioner mistaking it for a dropsical head and the other for the bag of waters.

Dr. Busey at the last meeting of the American Gynecological Society presented a paper upon cystocolpocele complicating pregnancy and labor: by cystocolpocele is meant prolapse of the bladder into the vaginal passage; and if the sac occupies the cavity of the pelvis, filling the hollow of the sacrum, pushing the os uteri beyond reach and occluding the vaginal passage, it is complete. One of the most marked results of this displacement of the bladder is lingering labor. The diagnosis is made by introducing the catheter into the bladder and evacuating it. This displacement of the bladder in relation to pregnancy and labor was very fully considered by Broadbent in 1863 in a paper read before the London Obstetrical Society. In referring to the diagnosis he states: "The prolapsed condition of the bladder is readily recognized on examination, especially when it contains urine in any considerable quantity. The cavity of the pelvis is found to be occupied by a bag of fluid easily distinguished from the fœtal membranes by the fact that it springs from the pubis, and does not permit the finger to pass between it and the symphysis. As this sac, the bladder, fills up the hollow of the sacrum, the os uteri cannot be reached till the urine is evacuated; and if this is done by the catheter, the instrument can be felt from the vagina and followed to every part of the

Fig. 274.



Cystocele complicating Pregnancy.

bladder. When the bladder is perfectly empty the displacement may be overlooked, but the finger, instead of circumscribing the lower segment of the uterus readily, meets anteriorly with the bladder, passing from the symphysis pubis to the uterus, and usually disposed in rugæ; the introduction of the catheter at once makes the case clear."

Whether known as cystocele, prolapse of the bladder, or cystocolpocele, the obvious indication is to empty the organ and press it out of the way of the descent of the presenting part of the fœtus.

According to Churchill, Guillemeau was the first to relate a case in which urinary calculus was an obstacle to labor: the result in this patient was contusion, sloughing, and vesico-vaginal fistula. Erichsen reports a case in which perforation was necessary; afterward the stone was removed by vesico-vaginal lithotomy.

Although instances of such obstruction to labor are comparatively rare, yet the serious consequences which may follow make it important to remove the obstacle from the birth-canal. It is usually advised to press the stone above the inlet, and if this fails, to perform vaginal lithotomy: probably in some cases the best method would be dilatation of the urethra and extraction of the stone, preceded, if necessary to reduce its size, by lithotrity.

Vaginal herniæ are rare complications of labor. The late Professor Charles D. Meigs has narrated a case of labor seen by him in consultation in which "a large mass of intestinal convolutions had fallen down below the uterus and filled the cavity of the pelvis, occupying the recto-vaginal cul-de-sac." The labor was brought to a rapid conclusion by the return of the prolapsed bowel into the cavity of the abdomen. Reduction of a vaginal hernia is usually readily accomplished, but if this is impossible, artificial ending of the labor is advised, and this immediately followed by restoration of the prolapsed bowel: it seems quite possible that capillary puncture of the hernia distended by gas might facilitate reduction or avert any danger of rupture in artificial delivery.

Cicatricial narrowing of the vagina has in some instances been the cause of difficult labor. The treatment is by artificial dilatation, preceded or followed by multiple incisions in the cicatricial bands. The cases of polypi obstructing the vagina were probably growths having their origin in the uterus.

Cancerous disease of the vagina is rare, and especially seldom has it been observed as a complication of labor. Naegele refers to a case of this kind under the care of Roederer in which perforation of the head of the fœtus was necessary for delivery.

Transverse partitions[1] or closures of the vagina have been met with, their origin probably being in an arrest of development; in one instance there were three of these, as observed by Nélaton. According to Delaunay, such transverse divisions are usually situated about the middle of the vagina or in its upper part. Of course the obstruction furnished by one of these bands is incomplete or pregnancy would be impossible; these are not usually discovered until after marriage, and then generally from their obstructing labor. In some of the instances collected by Delaunay uterine and abdominal contractions overcame the resistance either by stretching or by tearing the membrane, while in others division was necessary. A resisting hymen is to be incised, care being taken not to make the incision so great that there is danger of a tear extending to the vaginal wall and involving it.

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[1] *Étude sur le cloisonnement transversal du vagina d'origine congenitale,* Paris, 1877.

Schroeder has narrated a case of congenital ring-like stricture of the vagina, the stenosis being so marked that the finger could not penetrate it; he has also collected three similar cases. The Cæsarean section may become necessary in such a case, and, as remarked by Zweifel, is to be chosen rather than permit tearing of the vagina.

Morlane[1] refers to a cyst at the upper part of the vagina which, when he was about to open, was ruptured by the pressure of the fœtal head. As observed by Winckel,[2] referring to a reported case of cyst of the posterior wall of the vagina as large as a child's head, and which interfered with labor, and from which the obstetrician evacuated a pound of clear yellowish fluid, such history at once arouses a suspicion that the tumor was an ovarian cyst.

Hæmatoma of the vagina is less frequent than hæmatoma of the vulva, and each much more frequently appears after than during labor. The tumor arising from effusion of blood in the connective tissue varies in size from that of a pigeon's egg to that of the fœtal head at term; the source of the blood is usually rupture of venous vessels, but it may also come from rupture of an artery: it is not observed more frequently in women having varicose veins. Madame Sasanoff[3] has collected six cases, including one of her own, in which a hæmatoma appeared in the interval between the birth of twins. Dr. Dewees reported a similar case observed by him.

Should a hæmatoma of the vagina appear during labor, provided it be not so large as to interfere with the passage of the child, no interference is immediately required; only it is important to end the labor by the application of the forceps, for example, as soon as practicable, lest the tumor rapidly become larger in consequence of the voluntary efforts of the patient in straining during uterine contractions. But if already so large that labor is obstructed, the tumor must be opened and emptied; and here, too, the application of the forceps is advisable if the labor is not rapidly spontaneously ended. If hemorrhage continues before the child is born, a tampon may be necessary; Naegele advised a colpeurynter filled with ice-water. Hemorrhage continuing after the labor is to be arrested by pressure of an astringent tampon or by sutures passed under the bleeding vessels.

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[1] *Journal d'Accouchements*, t. i.

[2] *Diseases of Women.*

[3] *Annales de Gynécologie*, 1884.

In some instances there is great œdema of the vulva, and, while presenting no decided obstruction to labor, there may be such injury from pressure by the fœtus that subsequent sloughing occurs. The treatment is by puncturing the swollen parts.

The treatment of hæmatoma of the vulva does not differ from that advised for the similar affection of the vagina: here, however, pressure can be more effectively used for the prevention of hemorrhage after spontaneous or artificial opening of the tumor.

In consequence of the advanced age of a primipara or of the presence of cicatrices consequent upon injury or disease, the physiological softening and dilatability of the perineum may be absent, and the labor, at the close of the second stage, be seriously delayed. Means of relaxation failing or not being applicable, the remedy for the resistance is episiotomy; the incisions will be determined by the place of greatest resistance, but usually they are made, one on each side, in the inferior portion of the vulvar ring, care being taken that they are below the orifices of the Bartholinian ducts.

Budin[1] has especially drawn attention to the fact that exaggerated development of the muscular fibres of the levator ani may offer an obstacle to delivery. He cites two cases observed by him in illustration, and also quotes one from Revillout and one from Benicke, the former published in 1876 and the latter in 1878. The treatment he advises in case serious resistance is thus offered is, after anæsthesia with chloroform, the application of the forceps.

Narrowing of the vulvar orifice from cicatrices may result from inflammation following[2] a previous labor or from burns or other injuries. Division of cicatricial tissues uniting the labia or preventing dilatation of the vulvar ring must be employed. It has also happened that in an operation for ruptured perineum the operator has made the vulvar opening so small that it is utterly impossible for a fully-developed child to pass through it. In case this abnormal approximation of the anterior margin of the perineum to the pubic arch exists, in consequence, it might be said, of the operator doing his work too well, expulsive forces are toward the posterior portion of the perineum and the lower part of the recto-vaginal wall, making a deep bulging by the presenting part being driven to the bottom of this cul-de-sac; there is great danger of injury to the recto-vaginal wall or of central rupture of the perineum. The dangerous thinning of the tissues referred to must be promptly averted by episiotomy.

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[1] *Obstétrique et Gynécologie*, Paris, 1886.

[2] Dupuytren is to be credited with having recorded the most remarkable case of cicatricial contraction following injury to the perineum and vulva in labor. He had attended an unmarried girl in a concealed delivery; she received such injury to the perineum that he had to employ stitches after the labor was over. He kept the secret so well that the young lady's reputation remained untarnished. Some time after a gentleman brought his wife to him because of the contracted condition of the vulva, rendering intromission impossible. Dupuytren recognized his former patient, but did not reveal this knowledge to the husband; by some incisions the difficulty was removed and sexual intercourse made possible.

Zweifel[1] mentions the following unusual causes of obstruction of the birth-canal: Fibroid of the vagina, fibroid of the pelvic wall, carcinoma or sarcoma of the pelvis, colloid carcinoma of the rectum, retro-uterine hæmatocele, carcinoma of the liver, echinococcus, peritoneal abscess the size of a child's head in the left iliac region, exudate in Douglas' space, a lithopædion, cystic pelvic swelling the size of a child's fist, and vaginal hernia. To this list may be added a case reported by Guéniot[2] in which the obstruction was a hydatid cyst in the recto-vaginal wall, and one by Dr. Robert R. Stewart of Philadelphia, the obstruction being an extra-uterine gestation-cyst in Douglas' cul-de-sac. In Guéniot's case the tumor was spherical and as large as the fist; it was punctured in two places by a trocar, and then delivery of a living child by the forceps was accomplished.

Dr. Stewart has been kind enough to give me the following brief history of his very interesting case:

"On the evening of Jan. 23, 1888, I was called to see Mrs. M——, aged thirty-two years. When I arrived I found her in labor. I had previously delivered her of her first child, which was born Dec. 27, 1885; her menses first appeared after the birth of this child, March 17, 1887, and were last seen April 20th of the same year. Three, or almost four, months subsequently she consulted me for what she termed a weak stomach—*i. e.* morning vomiting. I asked her concerning her periods, and then informed her that she was pregnant, and that probably she would call upon me about the last of January or the beginning of February. This prognostication was verified. I should state here that during the whole period of gestation her general health was good, with the exception of some bronchial catarrh and slight failure of appetite; to use her own terms, she 'never felt better in her life.' Arriving at her house on the evening of Jan. 23, 1888, I learned that she had had slight pains from about noon, but that they did not amount to anything until about 9 P. M., after which time they increased until between eleven and twelve, when they became rapid and sharp; in fact, the first that I saw her in was while she was on her knees; she was unable without my assistance to get back to bed.

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[1] *Op. cit.*

[2] *Annales de Gynécologie*, t. xiii.

When she had rested somewhat, I made an examination, first *per vaginam,* and then *per rectum.* In the vaginal canal there was a large mass enclosed in a sac which almost completely obstructed the passage, only permitting the entrance of the finger after first pressing the obstructing mass backward toward Douglas' cul-de-sac, and then downward toward the perineum. After manipulating it in this manner, I was enabled to get my finger up to the os, which was dilated to the size of a silver dollar. After waiting for some time I ruptured the membranes, but still there was little or no progress. My next examination was *per rectum,* which enabled me to distinctly outline a fœtus (cranial bones next my finger) enclosed in the sac already described. The diagnosis, to my mind, was clear beyond doubt of a uterine and an extra-uterine pregnancy. I informed the husband of the state of affairs, and asked permission to call a consultation. Drs. Reyfus and Skilling were accordingly summoned. I told them of my diagnosis, and after an examination they fully concurred as to the condition of affairs. No time was now to be lost, for the woman was constantly sinking; pains were frequent; the uterus was forcing the living child down, but it was impossible for it to be expelled, owing to the obstructing mass which occupied the passage. Dr. Skilling suggested the application of the forceps to bring down the living child. It was decided, however, that this could not be done. I proposed to give ether and to cut the posterior wall of the vagina which formed the anterior wall of the sac. This we did, removing with forceps a blighted fœtus of six months, after removing by cutting and ligating as much as possible of the sac and membrane. Now we turned our attention to the uterus, and found that the child had rotated and assumed the occipito-posterior position. I applied the forceps again, and delivered a living female child weighing about eight pounds. The ether was now withdrawn. The patient was made as comfortable as was possible under the circumstances, and we concluded to await developments. The hemorrhage was not very excessive. Nothing further was done except to maintain her strength by administering some stimulants. At 10 o'clock the following morning, by appointment, Drs. R. and S. and myself met, and after taking temperature we put her upon appropriate treatment. She was very much exhausted, and we therefore concluded to disturb her as little as possible. A period of seven hours had now elapsed since delivery. The temperature was 101$\frac{2}{5}$°, pulse 128. On the second day, *i. e.*,

January	25,	Temperature,	101°,	Pulse,	120.	
"	26,	"	100,	"	98.	
"	27,	"	100$\frac{3}{5}$,	"	98.	Belly tympanitic; third day, very tender, with promise of peritonitis; fourth day, peritonitis
"	28,	"	100,	"	96.	
"	29,	"	99$\frac{1}{2}$,	"	92.	

January 30,	Temperature,	101°,	Pulse,	92.
" 31,	"	$101\frac{1}{5}$,	"	96.
February 1,	"	101,	"	96.
" 2,	"	$99\frac{2}{5}$,	"	84.
" 3,	"	$99\frac{2}{5}$,	"	92.
" 4,	"	$99\frac{1}{2}$,	"	86.
" 5,	"	99,	"	84.

very pronounced, which continued till the seventh or eighth, when it began to decline until the period of convalescence.

"We never varied our treatment from the beginning, keeping her quiet with opiates, administering quinine in antiperiodic doses, and using alternately antiseptic injections of bichlor. mercury and carbolic acid. I visited her this afternoon, February 11, 1888, and found her dressed and feeling quite strong, and was met by the inquiry from her as to when she would be able to resume her household duties."

Anomalies of the Pelvis.

Anomalies of the pelvis may be conveniently divided into those of position, of size, and of form.

The first division includes two varieties. The pelvis has a normal inclination or obliquity, and the deviations from this obliquity may be by excess or by defect; that is, the inclination may be increased or lessened.

So, too, the second division includes two classes—1, that in which the pelvis undergoes uniform increase, pelvis æquabiliter justo-major; and 2, that in which similar decrease occurs, pelvis æquabiliter justo-minor. The latter is described as a pelvis uniformly contracted: in order that a pelvis may be called contracted the true conjugate must be lessened one centimeter and a quarter, but if there be a uniform lessening of all the diameters one centimeter, or about four-tenths of an inch, then general contraction is said to be present.

The third division includes those characterized by change in the pelvic form: in the second class there are simply changes in size, the pelvis remaining symmetrical, but in this it becomes asymmetrical—its form perverted, or the pelvis is said to be deformed, and, so far as the injurious results in relation to labor are concerned, vitiated. Such deviations from the normal may involve the vertical diameters with reference to the transverse, or the latter with regard to each other, and these constitute the chief ones to be considered. The last presents three classes: 1, that in which the antero-posterior diameter is lessened; 2, the transverse diameter is lessened; and, 3, the diminution is in the oblique diameter.

These various pelvic anomalies will now be considered in the order that has been given.

I. Anomalies of Position.—As already stated, deviations from the normal obliquity of the pelvis are two; this obliquity may be increased or lessened.

Lobstein,[1] in an unpublished memoir presented to the Society of Medicine of the Faculty of Paris, 1817, first directed the attention of obstetricians to the consequences of too great or too slight inclination of the pelvis. The anterior obliquity may be so exaggerated that the axis of the inlet is horizontal. Moreau narrates a case in which the plane of the inlet was vertical, and there was also associated with this vicious inclination of the pelvis narrowing from rickets, which compelled the Cæsarean operation. Naegele has described the case of a married woman in whom the inferior strait was turned directly behind; the pubic symphysis and the upper part of the sacrum were directed horizontally, and consequently the plane of the superior strait was vertical: the venereal act never took place but in a position opposite to the natural one. She became pregnant, but the pelvis being normal no difficulty occurred at labor; six other consecutive pregnancies occurred, and ended with the same facility as the first.

By so-called posterior obliquity—a true obliquity in a backward direction of course is impossible—is generally understood a marked lessening of the normal obliquity, that may go to such extreme that the plane of the inlet becomes horizontal. This obliquity is usually associated with deformed pelvis, but it has been observed independently of such vitiation.

In cases of posterior obliquity or pelvic retroversion "the vulva is directed much more in front than usual, and the pubic symphysis presents a direction more or less approaching the vertical. The superior half of the sacrum has become parallel to the axis of the trunk, and the lumbar region is more or less without its posterior concavity—a flat back. Finally, the point of the coccyx is always found in the vertical position either at the level or beneath the summit of the pubic arch, and the last false rib is generally nearer the iliac crest than in the normal state."

In addition to these obliquities, Lenoir has given a description of lateral obliquity of the pelvis. According to Depaul, lateral obliquities are very frequently found in connection with rachitic skeletons, and even in cases of shortening, atrophy, or old luxations of the abdominal members.

Naegele, in referring to inclination of the pelvis, makes the following remarks: "Even when this inclination is normal, it quite often happens in cephalic presentation that the head presses upon the superior border of the pubic symphysis, and thus to some degree its entrance into the pelvic cavity is retarded. If in such cases the other conditions of the mechanism of labor are normal, this resistance is overcome soon by the efforts of nature, and delivery is accomplished without special difficulty. But if at the same time there is a more or less great disproportion between the head and the basin, the resistance presented by the anterior wall of the latter exerts a very injurious influence. This influence is much worse still when at the same time the inclination of the pelvis is too great. If, as frequently happens, an inclination exceptionally great coincides with narrowing of the pelvis, obstetric operations may be rendered much more difficult. For this reason it appears necessary in all cases where the head of the fœtus strikes against the pubic symphysis at entering the pelvis to have the woman lie in such a way that the lumbar vertebræ may be strongly flexed; that is to say, give her a half-sitting posture by raising the hips and the upper part of the trunk, or have her lie upon the side, her back bent forward, and the thighs strongly flexed upon the pelvis."

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[1] *Dictionnaire encyclopédique des Sciences médicales*, t. viii.

It has been advised, if deficient pelvic inclination hinders labor, to have the lumbar region elevated while the coccyx is placed lower.

II. Anomalies of Size.—This division, which includes uniform increase and uniform lessening of the size of the pelvis, might also be distinguished as symmetrical anomalies in contradistinction to the third class, in which the anomalies are chiefly asymmetric.

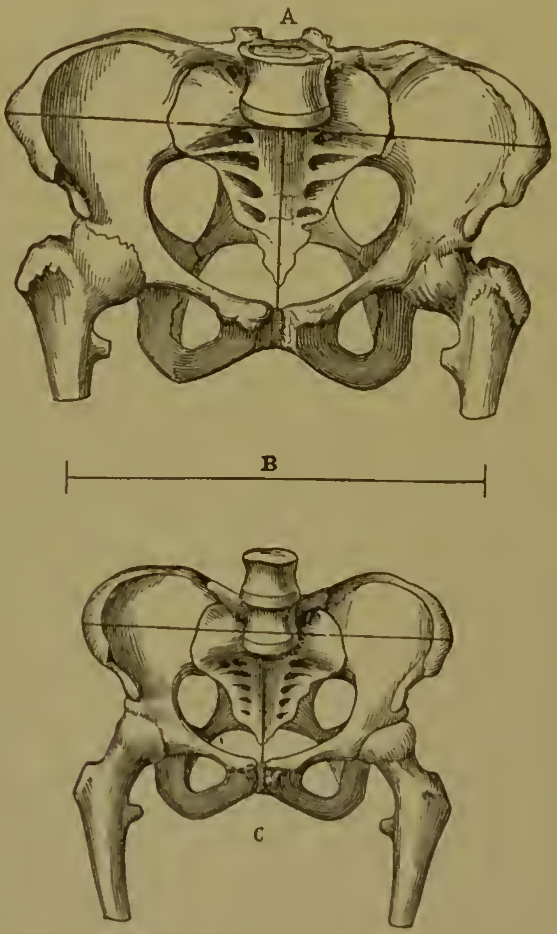
The subjoined diagrams, taken from Depaul, represent the justo-major and the justo-minor pelvis, while the line marked B is the measure of the distance between the iliac crests in a normal pelvis.

a. The Justo-major Pelvis.—In the pelvis marked A the distance between the antero-superior spinous processes was 28 centimeters, more than 11 inches, and that between the iliac crests 32 centimeters, more than 12 inches. The antero-posterior diameter of the inlet was 13 centimeters (5 inches), the transverse 16 centimeters (6.3 inches), and the oblique 15 centimeters (5.9 inches). The justo-major pelvis has been happily compared to the pelvis of a giantess found in a woman of ordinary size.

Schroeder held that the generally enlarged pelvis did not disturb the course of labor, not causing this to be rapid, and in short that it should not be regarded as pathological unless the same conditions were present as might be observed in the case of a normal pelvis. On the other hand, most obstetricians have taught that such a pelvis contributes to precipitate birth by the ampler canal through which the fœtus is transmitted. It is not necessary to repeat the statements previously made on page 693 as to the consequences to both mother and child which may follow too rapid delivery.

b. The Pelvis Justo-minor, or the Generally-contracted Pelvis.—This pelvis, as has been before stated, is characterized by a uniform lessening of its diameters: it is one of the most important anomalies of the pelvis. At least three varieties of this pelvis have been described. In the first the pelvis has the form characteristic of the sex, but seems to have been arrested in its development; the bones are frailer and smaller, and, while it is usually found in women whose stature is under the normal, it may also sometimes belong to tall women who are with this exception perfectly developed. While in another variety to be mentioned there usually is a departure from the strict definition of the justo-minor pelvis—uniform lessening of the pelvic measurements—this corresponds quite accurately. The second variety, the dwarf's pelvis, presents the usual characteristics of the normal female pelvis, only it is under size; there is a correspondence between the pelvis and the height, and the bones of the former correspond in their development as to size and firmness with those of the rest of the skeleton. The third variety is the masculine pelvis. This may have the exter-

Fig. 275.



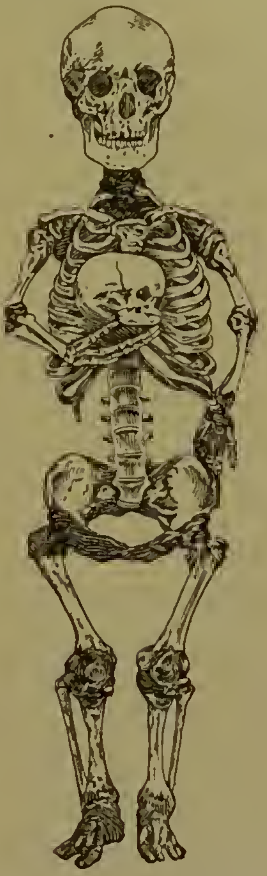
A, Justo-major Pelvis.
B, Normal Distance between the Iliac Crests.
C, Justo-minor Pelvis.

nal form of the female pelvis, but in some instances very strongly resembles the male. The bones are thick and strong; the sacrum is narrow; the ilia are straighter than normal; and the ischia are nearer each other. The external measurements may vary but slightly from the normal, and the contraction may not be uniform, but may concern the inlet, the cavity, or the outlet; in the latter case the pelvis becomes funnel-shaped.

The equally-contracted pelvis is not frequently seen; of its three varieties the masculine basin is the least, the dwarf's the most rare.

The causes of the justo-minor pelvis are generally obscure. In some instances the anomaly may result from rickets. This origin has been generally accepted. Zweifel states that he has seen one typical instance of generally equally-contracted pelvis which was caused by rickets, though this disease usually produces another abnormal form. Müller has mentioned the frequency of this pelvis in cretins and semi-cretins. Still, there remain the great majority of cases of this partial pelvic development which cannot be attributed to any constitutional disease, either hereditary or acquired.

FIG. 276.



Rachitic Woman[1] (Mütter Museum, College of Physicians, Philadelphia).

Before giving the diagnosis of the generally contracted pelvis, studying the mechanism of labor in such pelvis, and the treatment of labor then occurring, it is necessary to consider the means by which deformities of the pelvis are known—a subject the importance of which cannot be exaggerated.

Kleinwächter observes no error in diagnosis is so terribly avenged upon the mother and the child as one relating to contracted pelvis. It might be added that the vengeance falls, too, upon the obstetrician, for he can never escape self-reproach if, suitable opportunity having been his, he has failed to recognize the deformity in time to ward off at least some of its consequences, or possibly saving both mother and child by means appropriate to the emergency. A primigravida, for example, is in labor at the normal end of pregnancy; her form is apparently perfect, her health excellent, and there is not the least suspicion that the pelvis is abnormal. The first period of labor is somewhat longer than usual; the second is protracted until instrumental interference is demanded in her interest, if not in that of the child. One or more consultants come, and the forceps is tried, first one pattern, and then another, but all in vain. Meantime, serious inroads upon the patient's strength have been made, and disappointment at the delay in delivery almost brings her to despair. The next step is a craniotomy, the attendants now fully convinced that it is impossible for a living child to pass through the narrowed inlet. But before craniotomy and extraction of the mutilated fœtus can be completed she dies. Examination of the pelvis after death proves that the antero-posterior diameter of the inlet is barely two inches and a half. A timely Cæsarean operation would probably have saved both mother and child, or, this being refused, the mother's salvation might have been secured if the embryotomy had not been deferred until she was exhausted.

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[1] Fig. 276 is the skeleton of a rachitic woman and the skull of a fœtus that was removed from her by Cæsarean section. The operation was done by the late Dr. John B. Holmes of Charleston, S. C., assisted by Dr. West of North Carolina and Dr. Marsh of Maryland; the child was dead before the operation began, and the mother lived three days. As will be seen from the illustration, and as still better proved by the measurements, the pelvis was not only a dwarf's pelvis, but also a rachitic flat pelvis. The true conjugate was one inch and three-quarters, and the transverse four and a half inches, while at the outlet the corresponding diameters were three and a half inches and four and a quarter.—*Transactions of the Philadelphia Obstetrical Society*, 1879.

Diagnosis of Pelvic Anomalies.—This is made by the recognition and appreciation of signs which may be classified as probable and certain. The former are ascertained from the history of the patient, from her general appearance, carriage, walk, stature, etc., while the latter are sought by direct examination of the pelvis. In the history we learn as to sickness during infancy and childhood; as to the period when walking began; whether there was any bodily deformity observed at birth or any manifested since; whether any injury to the pelvic joints or dislocation of one of the femurs occurred in early life or in adolescence; whether one hip is higher than the other, or either femur is ankylosed. The vertebral column is examined for deformity, whether apparent or latent; if it presents a deforming curvature, the period of its first manifestation is inquired, for such curvature, if manifested first in infancy, is most probably caused by rickets; and this origin will be confirmed by examining the lower limbs as to being notably curved. In this case the pelvis is in almost all cases deformed. But if the spinal curvature began during adolescence, the cause is not rickets and the pelvis may be normal. The woman is lame, and the first origin and cause of that lameness should be ascertained.[1]

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[1] Peu[1] makes the following statement, which is interesting as one of the earlier obstetric references to deformed pelvis, and as also showing that this wise observer could not be beguiled by beauty, intellect, wealth, and social position into marrying a young lady who he believed from her lameness had a deformed pelvis: "I remember

[1] *La Pratique des Accouchemens*, Paris, 1695.

If the woman has previously been delivered, we inquire as to whether the labor was natural or artificial, whether the child was born living or dead, and in case of instrumental delivery what means were employed. If possible, too, ascertain further as to the cause of the difficulty in a previous labor or labors, for that may have been from an abnormal presentation or from excessive size of the child. It should also be remembered, on the other hand, that though the first labor may have been spontaneous, there might still be some narrowing of the pelvis, which would render subsequent ones difficult from the increasing size of the children.

Certain Signs.—As before stated, the positive proofs of pelvic deformities are obtained by measurements of the pelvis, or pelvimetry. These measurements are made by an instrument called a pelvimeter, by an ordinary tape-measure, and by the hand or fingers. The pelvimeter most generally employed is that of Baudelocque or that of Martin: the latter instrument has the recommendation of being quite portable, and is represented in use in Fig. 277. In using the pelvimeter the woman should be lying upon her back, and the lower portion of the body exposed, or at least covered with only one thickness of very thin material. Before beginning to measure with the pelvimeter, the obstetrician applies his hands externally to the pelvis, ascertaining whether one hip is higher than the other, finds out whether there is decided narrowing of the hips, the thickness and size of the iliac bones, the depth of each iliac fossa, the breadth and curvature of the sacrum, and the height of the pubic joint. Next the external measurements are made: first, the distance between the anterior superior spinous processes of the iliac bones, one of the knobs of the pelvimeter touching the one process, and the other placed upon the process of the opposite side: this is usually 25 centimeters, or about 10 inches; second, the greatest distance between the iliac crests at their external margin is similarly ascertained: this diameter is 28 centimeters, or 11 inches.

that at the time of the second Paris war, having recently settled, it was proposed to me to marry a beautiful young lady, rich, very spirituelle, and one whose father I greatly honored; but she was small and lame in one lower limb. The consequences of the lameness which I apprehended prevented me from making this alliance. One of our aspirants in surgery, braver than I, or perhaps more unfortunate, fell in love with her and married her. Unfortunately, she became pregnant. Shortly her abdomen touched the ground, and she fell from the slightest misstep. Her frequent falls compelled her to lie in bed. Her child died, and she also when about eight months pregnant."

Further reference to lameness as indicating deformity is given by Dionis.[1] He has remarked that "the lame who have one of the hip-bones higher than the other sometimes have great difficulty in labor, because the basin formed by these bones is not exactly round, and the infant is obliged to redouble its efforts in order to go through the passage."

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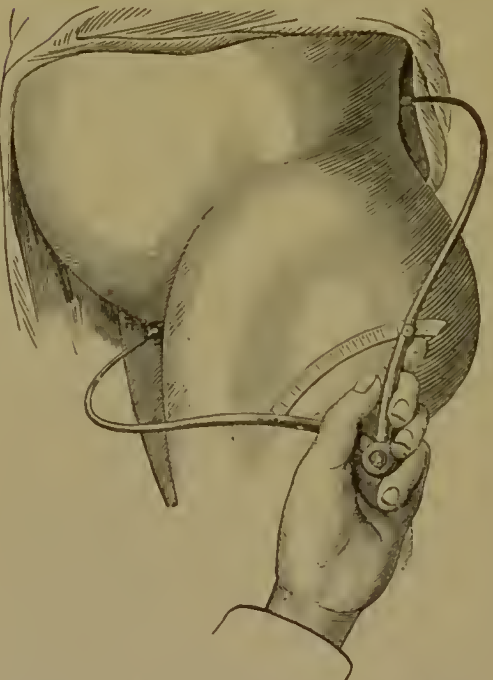
[1] *Traite général des Accouchemens*, 1718.

The third measurement made is that between the great trochanters; this in case of a normal pelvis is 31 centimeters, or 12¼ inches. If these three diameters are normal, we know that there is no lateral narrowing of the pelvis. The fourth measurement is taken from the spinous process of the last lumbar vertebra to the middle of the anterior surface of the pubic joint. This diameter, known as the external conjugate or the diameter of Baudelocque, enables us to approximate the probable diameter of the pelvic inlet, or the true conjugate; the former measures 20 centimeters (7.9 inches), and by deducting from it 8 centimeters (3.1 inches), the latter is approximately ascertained: such deduction is supposed to correspond with the combined thickness of the pelvic walls anteriorly and posteriorly. But the only absolutely certain fact which we reach by measuring this diameter is, that if the distance be notably diminished the true conjugate is less than normal.

The circumference of the upper or false pelvis is learned by applying the end of an ordinary tape-measure to the spinous process of the last lumbar vertebra, and carrying the tape along the iliac crest of one side, and thence to the median line at the pubic joint; similarly, the other half is measured, the results added, and thus the entire circumference is ascertained. Evidently, if the one measurement is greater than the other, the pelvis is asymmetrical. So too such asymmetry may be determined by comparing the two external conjugates, or, still better than the latter, measuring the distance of the trochanter of one side to the middle of the iliac crest of the other, and *vice versâ*. The normal circumference of the false pelvis is 90 centimeters = 35.5 inches.

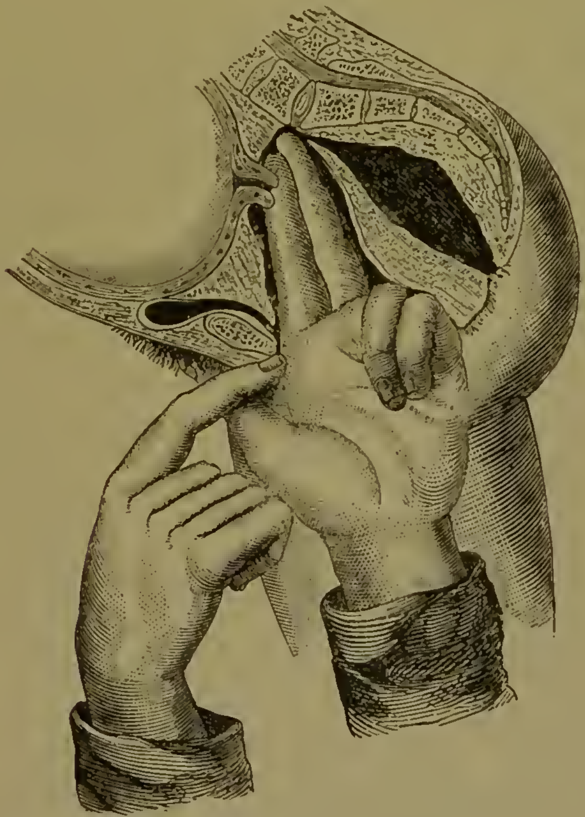
Fig. 277.



Measuring the External Conjugate with Martin's Pelvimeter.

Next, the diagonal conjugate—that is, the distance from the lower margin of the pubic joint to the promontory of the sacrum—is found usually by means of one or two fingers. In the following illustration the index and medius of the left hand are extended, the thumb abducted, and the third and fourth fingers folded upon the palm; the extended fingers are carried up and backward in the pelvic cavity until the promontory is touched; then, still keeping up this contact, the hand is brought upward until its lateral margin, just below the index finger, comes in contact with the subpubic ligament. Next, this last point is marked by the nail of the index finger of the right hand; then the left hand is withdrawn, and the measurement made from this mark to the tip of the finger. Kleinwächter holds that the introduction of the index and medius at the same time ought not to be permitted, except perhaps in the case of a multigravida, because the stretching of the soft parts by two fingers will cause pain; but he adds that in very difficult cases the half or the whole hand may be used. There is no great difficulty in reaching the promontory if the pelvis is normal, and of course it is more accessible if the true conjugate is shortened.

FIG. 278.



Measuring the Diagonal Conjugate.

If the basin be normal the true conjugate may be found by subtracting 15–16 millimeters ($\frac{5}{10}$ – $\frac{6}{10}$ of an inch) from the diagonal conjugate. "It is evident that this subtraction will vary according to the angle which the true conjugate makes with the pubic symphysis, and as to the height of the symphysis. It is increased with the obtuseness of the angle and with the elevation of the symphysis. Hence, with the various pelvic deformities the subtraction will vary. Though the height and thickness of the symphysis may be ascertained, but not the angle which it forms with the true conjugate, the latter can only be estimated, and hence slight errors may be made. Nevertheless, with proper skill the length of the true conjugate may be determined within a few millimeters, and the error is so slight that it may be regarded as of no importance."

Measurements of the diameters of the pelvic outlet are of much less importance; nevertheless, they may be required in some cases. To obtain the antero-posterior diameter, the woman lies, for example, upon her left side, and the obstetrician with the thumb and index finger of the right hand—the former externally, the latter in the vagina—finds the sacro-coccygeal joint, and includes it between the thumb and finger. The end of the finger is fixed at that point, while the mass of the finger is carried forward and upward until its lateral surface is brought against the subpubic ligament, and while held firmly in that position is marked by the nail of the index finger of the other hand, as in ascertaining the diagonal conjugate. Upon withdrawing the finger the distance from the mark to the tip is measured, and this will give the desired diameter. Breisky places one of the knobs of the pelvimeter externally at the sacro-coccygeal joint, while the other is put at the lower margin of the pubic joint; now, subtract from the measure thus obtained 1 to 1.5 centimeters, and we then have the antero-posterior diameter. Breisky recommends for measuring the transverse diameter of the pelvic outlet Osiander's pelvimeter. The knobs are placed upon the ischial tuberosities, and from the measure thus obtained of the intervening distance between the tuberosities, 1–2 centimeters must be subtracted for the thickness of the soft parts. Frankenhäuser's method is to place the thumbs, their nails being directly opposite, upon the most prominent surface of the inner margin of the ischial tuberosities, and then with Osiander's pelvimeter measure the distance between the nails.

Barbour[1] states that the transverse diameter of the outlet is best estimated by Chantreuil's method: "Place the patient in the genu-pectoral posture or in the lithotomy posture, though the former facilitates the measuring; pass the index fingers into the vagina, and turn them back to back so that the pulp of the finger rests on the inner surface of the ischial tuberosities; an assistant lays the points of the calipers on the palmar surface of the fingers just outside the vulva, the distance of which apart corresponds to the inside measurement between the tuberosities. This allows us to use the ordinary calipers."

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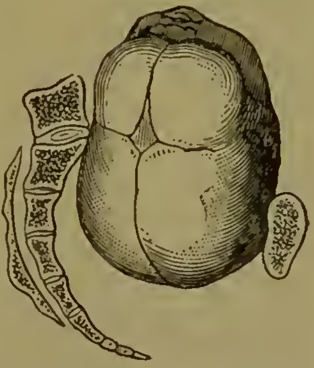
[1] *Spinal Deformity in Relation to Obstetrics.*

Diagnosis of the Justo-minor Pelvis.—The distances between the iliac anterior superior spinous processes and between the iliac crests are found less than normal in all cases, an exception being made for the masculine pelvis, for in it, in consequence of the increased thickness of the bones, these differences may be very slight or even absent. The pelvic circumference is lessened, as is also the true conjugate. Contraction at the outlet will be suggested by the apparent approximation of the ischial tuberosities and spines, and be confirmed by ascertaining that the antero-posterior and the transverse diameters are under the normal.

LABOR, AND ITS TREATMENT IN THE GENERALLY-CONTRACTED PELVIS.—Labor begins with the fœtal head at the pelvic inlet, for there is not, as there is in the majority of primigravidæ having a normal pelvis, descent of the head into the pelvic cavity during the last weeks of pregnancy. The resistance of the lessened inlet compels strong flexion of the head upon the chest, and thus, with the occiput below, the head enters, the biparietal diameter corresponding with the conjugate, and the suboccipito-bregmatic with the transverse; the sagittal suture at first probably lies in the transverse diameter. The uniformity of the pelvic contraction shows itself by the strong resistance to any lessening of flexion, there being such constant and strong pressure upon the frontal arm of the head-lever.

FIG. 279.



Marked Flexion of the Head entering a Generally-contracted Pelvis.

Zweifel, in describing the mechanism of labor in generally contracted pelvis, says the sagittal suture may sometimes be in the transverse or in the oblique, or even in the antero-posterior, pelvic diameter, and hence the child's head becomes elongated. This elongation, however, cannot be in the occipito-mental diameter, but rather in that described by Budin as the maximum diameter, for the squamous portion of the occipital bone is pushed under the parietal bones, this movement being permitted by the cartilaginous connection between it and the basilar portion. So, too, the equally strong compression to which the head is subjected on all sides compels overriding of the frontal by the parietal bones, while the posterior of the latter overrides the anterior. The caput succedaneum is large and long, even in some cases protruding from the vulvar opening while the head is in the cavity. Anterior rotation of the head does not occur, but the occiput passes out over the perineum.

From the head remaining so long at the pelvic brim while strong uterine contractions are going on, there is danger of injury to some portions of the lower uterine segment, resulting in subsequent inflammation, or actual perforation by long-continued attrition may result. So, too, exhaustion may come on to such degree that the life of the mother is imperilled, the uterus falling into a state of atony. The long continuance of the labor carries danger to the fœtus, and so too injury may result from the strong compression of the fœtal head.

Delay in rupture of the membranes until the os is fully dilated, descent of the occiput rather than of any other part of the fœtus, moderate size of the fœtus, yielding character of the bones of the head, and on the part of the mother a slight degree of pelvic contraction and vigorous uterine and voluntary action, are to be regarded as propitious, the labor under these circumstances usually terminating favorably for both mother and child.

On the other hand, early rupture of the membranes, great size of the child, unyielding nature of the cranial bones, and unfavorable presentation—as, for example, of the pelvis, usually a knee or foot descends first because of the difficulty of the pelvis entering the inlet—of the brow, or of a shoulder, will make the prognosis unfavorable.

But the most important condition to be considered is the degree of pelvic contraction, and this largely governs not only the prognosis, but also the treatment.

If the obstetrician recognizes in case of general pelvic contraction in a pregnant woman that the true conjugate is under 9 centimeters (3.5 inches), he will be not unduly cautious should he induce labor at eight months; and the obligation to do this becomes positive if the diameter is 8 centimeters (3.1 inches). If the true conjugate falls below 8 centimeters, the selection must be made between embryotomy and the Cæsarean section. How low it must fall to render the latter imperative is unsettled. Some make that limit two inches and a half—it is rare that in general pelvic contraction the true conjugate is lessened this much—while others reduce it much lower. Wasseige regards the limit of delivery through the natural passage 4.5 centimeters (or 1.6 inches), while Kleinwächter[1] states that if the length of the true conjugate is less than 6.5 centimeters (2.5 inches), the Cæsarean section cannot be avoided. Barnes holds that craniotomy finds its application where labor at term is obstructed from pelvic contraction, conjugate ranging from 3.25 inches—3.50 as a maximum—to 1.75 or 1.50 as a minimum. Zweifel teaches that with a conjugate below 6–5 centimeters (2.37–2.12 inches) there is absolute impossibility of removing the child except by the Cæsarean operation. With this conflict of great authorities the obstetrician may well hesitate. But, on the other hand, considering the great improvements in the Cæsarean operation, leading to a greatly lessened mortality, such operation, the mother consenting, will be selected if the conjugate is 2.5 inches or less.

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[1] *Des Operations obstetricales.*

The forceps is not applicable in general contraction of the pelvis until the head is completely moulded. If the obstetrician is misled into resorting to this instrument before this moulding, this adaptation of the head to the narrow canal it is to traverse, is accomplished, the error is avenged most severely. The pelvic bones or joints may be seriously injured, the soft parts torn; a dead child is delivered, and the mother is liable to perish subsequently. So, too, podalic version is not indicated if the head presents, for extraction after turning cannot be effected soon enough to save the child's life; the head must be moulded to the passage in a few minutes—a process which Nature's forces require hours to accomplish. Further, if craniotomy should finally become necessary, the difficulties of the operation are increased because of the head coming last. Another objection to delivery by podalic version is the almost inevitable ascension of the arms caused by the pelvic contraction. In those cases where the contraction is chiefly at the inlet the mechanism of labor after the head has entered the cavity is the same as in a normal pelvis; and then, too, the treatment corresponds.

III. ANOMALIES OF THE PELVIC FORM, OR ASYMMETRICAL CHANGES IN THE PELVIS.—Two divisions of this class are made, the first including changes in the depth of the pelvis: *a.* That in which the vertical diameters of the pelvis are increased, without a corresponding change in the horizontal. Such change increases the depth of the pelvis, but alone does not, to an important degree, modify the course of the labor; the latter will be longer, and in some cases its protraction may require the use of the forceps.

b. The second class embraces those pelves whose depth is lessened. But this change is in almost all instances associated with pelvic deformities. If occurring independently, all the horizontal diameters being normal, other things being equal, the duration of labor is lessened.

The second division is much more important, and includes those changes which deform, render asymmetrical, or vitiate the pelvis. It embraces three varieties: 1, those characterized chiefly by shortening of the antero-posterior diameter; 2, a like change in the transverse; and, 3, the same in the oblique diameter.

The following subdivisions are made of these three classes of pelvic deformities. These subdivisions are the same as those adopted by Zweifel:

I. Pelves chiefly contracted in the antero-posterior diameter:
  a. The flat pelvis;
  b. The rachitic flat pelvis;
  c. The generally contracted flat pelvis;
  d. The spondylisthetic pelvis;

e. The pelvis flattened by double luxation;
f. The lumbo-lordotic pelvis.

The last originates in lordosis of the lumbar vertebræ, which is compensated by a deeply situated kyphosis. In consequence of the lordosis the lumbar vertebræ may project over the pelvic entrance, causing the deformity known as pelvis obtecta, or roofed pelvis. In the osteomalacic pelvis, to be described in the next class, there is also considerable contraction in the antero-posterior diameter.

II. Pelves chiefly contracted in the transverse diameter:
a. The osteomalacic pelvic;
b. The ankylotic transversely contracted pelvis;
c. The kyphotic transversely contracted pelvis.

In *b* and *c* the narrowing is only in the pelvic outlet.

III. Pelves chiefly contracted in their oblique diameter:
a. The ankylotic obliquely contracted pelvis;
b. The coxalgic pelvis;
c. The scoliotic pelvis.

Neoplasms originating in the pelvic walls constitute a final class of pelvic contractions.

The Simple Flat Pelvis.—This pelvis may be found in women who present no other anomaly of form which would awaken the slightest suspicion of its presence. They are usually of normal stature and apparently of perfect development. There is no history of disease of the bones in infancy or childhood, or of injury to spine or pelvis or lower limbs in adolescence. How often has this anomaly led to the most deplorable results in childbirth! Even in Europe this pelvis is found a little more frequently than the rachitic, while the American obstetrician will meet with it oftener than any other pelvic anomaly, and thus forewarned ought to be forearmed.

The cause of the deformity is not readily ascertained. The latter consists essentially in an approximation of the sacral promontory to the anterior pelvic wall. and this sinking of the sacrum has been attributed to walking too early, to sitting too long at a time in infancy, and also simply to the weight of the body, though neither of the other causes may be justly adduced. Still another explanation of the etiology has been suggested—the carrying of heavy weights in childhood; but the occurrence of the anomaly in women who were never subjected in childhood to severe toil renders necessary the explanation that has been given—viz. the simple weight of the body may cause the deformity.

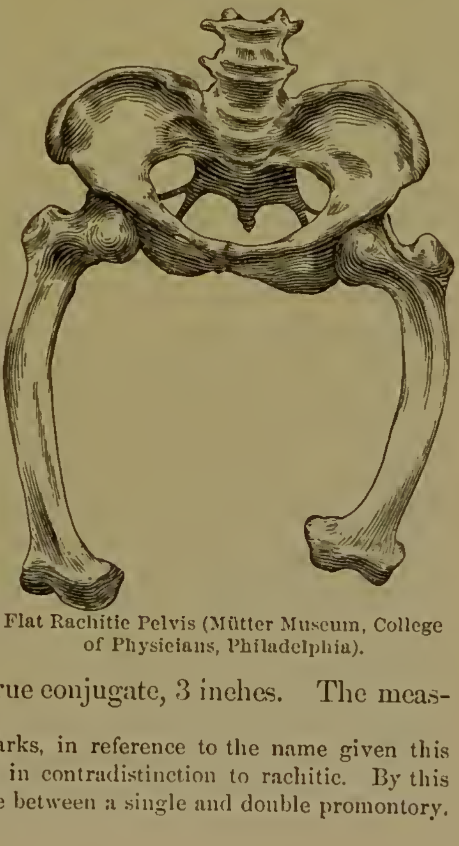
The descent of the sacrum is without any rotation upon its transverse axis, and the approximation of this bone to the pubic bones, and the shortening, involve only the antero-posterior diameter of the inlet, or if those of the cavity and outlet are lessened the diminution is very slight. The descent involves strong tension upon the ilio-sacral ligaments, which would cause separation of the iliac bones if it were not for the resistance of the pubic joint; and the consequence is that the transverse diameter undergoes slight increase and the pubic joint is brought nearer the sacrum.

Schroeder states that in very rare cases a flattened pelvis is also narrowed in the transverse diameter of the outlet. In a practical point of view, this is a very important complication of the flattened pelvis. Sometimes the articulation of the first with the second sacral vertebra, which remains unossified, forms that which is called a double promontory; that is to say, the two vertebræ meet at an obtuse angle posteriorly, and the articulation makes in contracting a projection in the pelvic cavity.[1] If a line be drawn from this crest to the pubic symphysis, it is as short as, or even shorter than, the true conjugate itself, and, as this anomaly has an essential obstetric importance, it is necessary to count it in pelvic measurement.

The diagnosis of the flat, non-rachitic pelvis is readily made by measuring. The transverse measurements are normal or slightly increased; the circumference is normal or slightly decreased, but the two sides of the upper pelvis are symmetrical; the external conjugate is always diminished, and by this diminution, combined with that of the diagonal conjugate, the true conjugate is found, which of course is less than normal, and in the great majority of cases at least 8 centimeters (3.1 inches).

Rachitic Flat Pelvis.—This deformity results from pressure upon the base of the sacrum chiefly, causing not only descent of this bone, but also a partial anterior rotation upon its transverse axis; thus the promontory is brought nearer the pubic joint, and the true conjugate necessarily shortened. In a flat rachitic pelvis in the Museum of Jefferson Medical College I find the following measurements of the pelvic inlet: Oblique diameter, 5 inches; transverse, 5½ inches; and true conjugate, 3 inches. The meas-

FIG. 280.



Flat Rachitic Pelvis (Mütter Museum, College of Physicians, Philadelphia).

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[1] Schroeder. Nevertheless, Zweifel remarks, in reference to the name given this pelvis, we use the expression plain, *einfach*, in contradistinction to rachitic. By this term Michaelis first expressed the difference between a single and double promontory.

urements of the outlet are—anterior-posterior, 3¾ inches, and the transverse 4. The depth of the pelvis at the pubic joint is 1¼ inches, at the sides 2¾ inches.

Rickets is a disease occurring in infancy or early childhood, chiefly characterized by a disorder of nutrition and development of bony tissue, the disorder involving various deformities of the skeleton, swelling of the epiphyses, bending or fractures of the diaphyses, important changes in the shape of the pelvis, and frequently curvatures of the spine. While in almost all cases it is a disease of extra-uterine life, yet there have been instances in which it occurred in utero, probably the first recorded one being given by Glisson in 1650. In 1645 a committee of eight physicians was appointed by the College of Physicians of London to study a disease known in popular language as the rickets, which appeared to be quite general in the south-west of England. The name, though poorly expressing the condition, remains, but it is quite as suitable as rachitism, which is now used as a synonym.

The special nature of the disease consists in the formation of the cartilaginous basis of bone, but the calcareous deposits fail. It is a disease especially of poverty, and is found most frequently in the large cities of the Old World, where the poor abound and the children of the poor often so greatly suffer from want of sufficient food, fresh air and sunshine, and proper clothing. Arnott[1] speaks of its being frequent in India, though he also states that, so far as his experience goes, osteomalacia is relatively to rickets and also absolutely more common in India than in Europe.

The child suffering from rickets does not walk as early as healthy children, but is much of the time in a sitting posture; the pressure of the body's weight causes not only the changes in the position of the sacrum previously stated, but also, through the resisting tension of the ilio-sacral ligaments, drawing of the innominate bones, so that they would separate if it were not for the resisting pubic joint; this separation being impossible, the bones yield, and hence the transverse diameter of the inlet is increased, "just as a long bone may be fractured in the shaft by a force applied at one end, the other end resisting." In consequence of the weight of the body resting upon the ischial tuberosities, and by the action of muscular traction, the former are more widely separated, and also the pubic rami, and the pubic arch is broadened.

If the child walks during the disease, the pelvic deformity is greatly increased, there being superadded the changes caused by pressure upon the acetabula. "The parts adjacent to the acetabula are pressed into the basin by the resistance of the heads of the femurs, and thus the sacro-cotyloid diameters are lessened. In consequence of the approach of the ilio-pubic tubercles the ischial spines are pressed in the pelvis;

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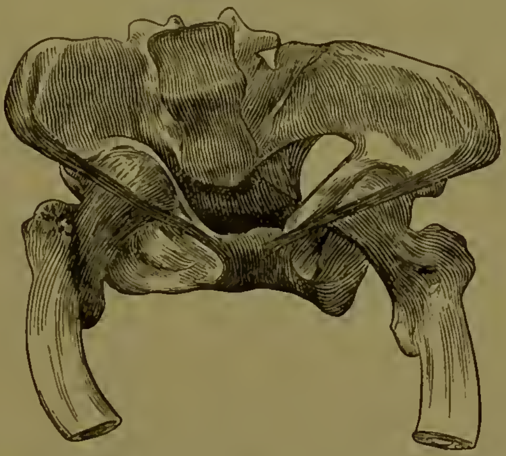
[1] *Transactions of the Edinburgh Obstetrical Society,* vol. x.

the approximation of the former causes a beaked protrusion of the pubic joint." In the highest degree of the deformity the lumen of the pelvis is almost closed, and with bending of the sacrum and iliac bones the pelvis may take a triangular form, and is known as the pelvis triloba, or the pseudo-osteomalacic pelvis.

FIG. 281.

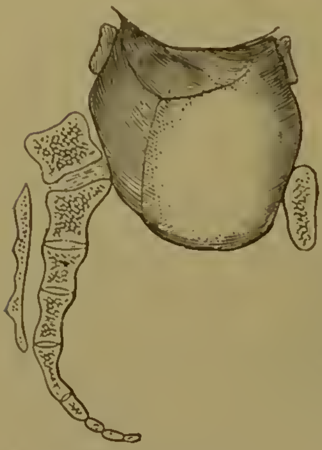


Pseudo-osteomalacic Pelvis (Mütter Museum, College of Physicians, Philadelphia).

Turning from these graver deformities of the pelvis caused by rickets, we will now consider the diagnosis of the simply flat rachitic pelvis. The history of rickets is learned, and many of its obvious consequences in other parts of the skeleton may be present. The distance between the antero-superior iliac spines is equal to, possibly exceeds, that between the iliac crests; the external conjugate is always lessened; the true conjugate is shortened; in some instances the second sacral bone protrudes into the pelvic cavity, making what is called the false promontory, and this may be more prominent than the true, when, of course, it becomes one of the terminal points of the conjugata vera. The antero-posterior and transverse diameters of the outlet become unusually large in comparison with the contraction at the inlet.

The Mechanism of Labor in the Simple Flat and in the Rachitic Flat Pelvis.—In consequence of the narrowing of the pelvic inlet in the conjugate, the head of the fœtus not only does not enter the pelvic cavity, as is the rule in the last weeks of pregnancy in primigravidæ, but it is turned aside at the brim, and hence the proportion of transverse presentations is increased. Another factor in causing such malposition of the fœtus is found in multigravidæ in the relaxed abdominal wall, which permits anterior displacement of the uterus. If the pelvis be below, its descent through the narrowed aperture does not occur, but the feet are prone to enter. Supposing the head to be at the inlet when labor begins, this takes a transverse position; that is, the sagittal suture instead of being oblique lies directly from one side toward the other of the pelvis. Resistance to the descent of the occiput compels a partial deflection, and the anterior and posterior fontanelles are in about the same pelvic plane; thus the transverse diameter of the fœtal head is in the pelvic conjugate, and the occipito-frontal in the pelvic transverse. But in this accommodation the anterior parietal is somewhat in advance of the posterior, and therefore the sagittal suture approaches the sacral promontory. (See Fig. 282.)

Fig. 282.



Head passing through the Inlet in Flat Pelvis.

The anterior parietal bone, pressed against the anterior pubic wall, becomes the fixed pivotal point around which a partial revolution of the posterior parietal occurs in the descent until the promontory is cleared. But in order that this descent can occur, the transverse diameter of the head must be lessened; this lessening is in part accomplished by the lateral margin of the posterior parietal passing under the corresponding part of the anterior parietal. In some instances the revolution is reversed; that is, the posterior parietal is fixed at the promontory, while the anterior moves down; then the relations of the parietals are changed, in that the posterior overrides the anterior. Further diminution of the head transversely may be effected by indentation, deep depressions, or even fractures or fissures of the revolving parietal. After the head has passed the inlet the subsequent mechanism is the same as in normal labor, and often then the delivery is more rapid from the ampler space furnished by the cavity, and especially by the outlet in the pelvis flattened by rickets, as has been previously stated.

In exceptional cases the sagittal suture is placed so near the pubic or the sacral wall of the inlet as to make what has been termed a parietal presentation; and if this presentation is not rectified delivery is impossible without craniotomy. Descent of the frontal bone first may occur in great narrowing; then the two halves of the bone play a corresponding part to that of the parietals in relation to the pubic and the sacral wall of the pelvis. Whether parietals or the frontal halves pass the strait first, the posterior bone has a distinct pressure mark from its being so strongly forced against the promontory.

In case the pelvis was originally very wide in its formation and the sacral promontory projects greatly, giving the pelvic inlet somewhat the form of the figure 8, the head if very small may pass through one side of the inlet, usually the left side because of the greater frequency with which the occiput is found upon that side of the pelvis; and in consequence of this aperture usually being round, the mechanism is that described as occurring in the justo-minor pelvis. In pelvic presentation one or both feet usually descend first; if the contraction is slight, the body passes through it without serious difficulty; then the head may pass also—of course it must be in a transverse position for this passage—flexion being continued; the posterior parietal bone suffers from pressure in passing the promontory. In more decided narrowing departure of the chin from the chest is observed.

Complications of labor in narrow pelves are transverse presentations, prolapse of the umbilical cord, and failure of vigorous uterine contractions. The same danger of injury to some parts of the lower part of the uterus, bruising or perforation from the pressure of the fœtal head, that were mentioned in describing labor in the justo-minor pelvis, may be present here. Nevertheless, if the contraction of the pelvis be only moderate, obviously the prognosis is better than in that pelvic anomaly; for in the latter the struggle is continuous during all the passage of the head through the bony pelvis, while in the other the narrowing is of only a part of the canal; and this narrowing, too, has a partially compensating increase in size of the diameter at right angle to the one shortened. If the presentation is favorable, the child not of abnormal size, and uterine action is vigorous, the result may be regarded hopefully. Of course, conditions opposite to those stated would be unfavorable. So too, if the woman has previously given birth to children, the difficulty in delivery may be notably increased—first, by the probably greater size of this child, and, second, by the lessened vigor of the uterine muscle.

In the management of the labor care should be taken to keep the membranes unruptured until the os is dilated, and hasty intervention while the head is being moulded to pass through the narrowed inlet must be avoided. If nature is unable to effect the passage of the head through the inlet, and indeed the former remains above it, resort to the forceps is not indicated, but podalic version. In regard to the former means, Zweifel observes that the application of the forceps to the movable head is not impossible, but to seize it firmly is purely accidental; an application of the blades over the parietal bones is absolutely impossible; and even if the head were thus grasped, it could not be drawn through the conjugate. Version comes only in those cases in which the forceps cannot be used; and even then the question, as Schroeder has framed it, is, Shall we turn, or wait? "Whenever we perform version in contracted pelves we decide in favor of this operation without knowing, in case this is not done, how the head would enter the true pelvis and how it would pass through. This renders the question as a practical one so difficult, and will probably thus keep it for a long time, probably for ever."[1]

There must also be borne in the mind of the obstetrician that, if he resorts to turning, it is essential to the life of the child that its transmission through the narrowed inlet must be rapidly accomplished—that there is in effecting this danger of injuring the members or other parts of the fœtus, and, though the child is delivered living, it may be maimed, its brain injured either with or without fractures of cranial bones: it is not so much mere turning the child that presents serious difficulty or danger, but the following extraction.

In regard to those cases of such narrowing that even a mutilated child cannot be transmitted, nothing need be added to what has been previously stated under the head of the justo-minor pelvis.

Generally-contracted Flat Pelvis.—In this form there is a greater degree of descent of the sacral promontory than is found in the generally-contracted pelvis, and the entire deformity rarely occurs except as a consequence of rickets. Not only all the pelvic diameters are below the normal, but the true conjugate is especially shortened.

The Spondylolisthetic Pelvis (from *σπονδῦλος*, probably, more correctly, *σφονδῦλος*, vertebra; and *ολισθεσις*, a slipping or gliding).—This deformity arises from a gliding or slipping forward of the last lumbar vertebra, so that it no longer rests upon the upper surface of the first sacral vertebra completely, but only partially; or even, in an excessive degree of spondylolisthesis, the posterior wall of the body of the former vertebra may be fixed to the anterior wall of the body of the latter, a synostosis occurring. Sometimes, indeed, the lumbar vertebral column glides down to the body of the second sacral vertebra. The lumbar vertebræ thus sinking, lordosis results, and the lower edge of the fourth lumbar vertebra, or the union between the third and fourth, or even that between the second and third, is opposite the pubic joint.

This pelvis was first described by Rokitansky. The question as to the cause of the deformity has been much discussed. From the firmness of the transverse processes of the normal vertebræ, it would seem impossible for a dislocation of one of the bodies to occur; and the view generally held as to its origin in the majority of cases is that a fracture of the vertebral arch anterior to the articulating processes—this fracture caused by a fall upon the sacrum—and hence dislocation, becomes possible. "If a person should thus fall with the body bent forward, the sacrum being fixed at the moment of the accident, the force will mainly act upon the body and arch of the last lumbar vertebra, and a fracture of the arch would very probably occur." Zweifel remarks that we cannot overlook the weak side of this, F. L. Neugebauer's theory, and that is, hitherto the traces of such a healed fracture have been found in only one case. Nevertheless, he also states that a traumatic, and hence extra-uterine, origin of spondylolisthesis must be admitted for the majority of cases. There may also be congenital spondylolisthesis, the origin of the disease from the failure of coalescence of ossification-centres in the vertebral arches, thus permitting dislocation of the vertebral body. This deformity is rare; Kleinwächter, writing in 1882, states that only fourteen cases have been observed.

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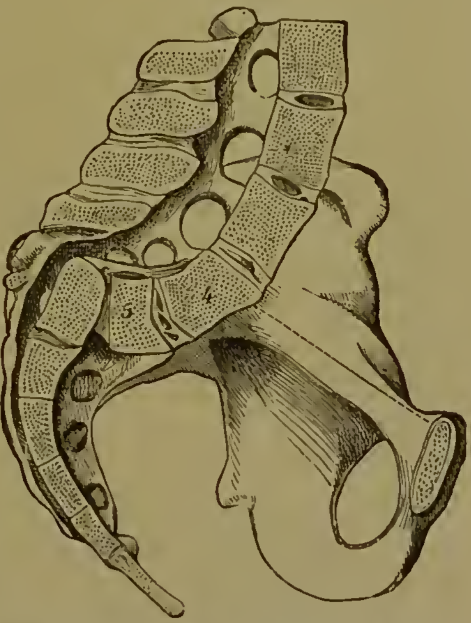
[1] For the most important discussion in this country of the relative merits of versions and of forceps in contracted pelves, see *Transactions of the Philada. Obstetr. Society*, 1874–75. The discussion was between Drs. Goodell and Wilson.

FIG. 283.



Spondylolisthetic Pelvis, showing dislocation into the pelvic brim of the lumbar vertebræ. The "Prague pelvis;" 4, fourth vertebra; 5, fifth lumbar vertebra (Kilian).

The diagnosis is made by the increased distance between the posterior superior iliac spines; by the marked lordosis just above the sacrum; by the shortening of the abdomen, its contents sinking so much between the ilia; by the peculiar "rocking gait" of the pregnant woman; by the absence of any history or present manifestation of rachitis or of osteomalacia; by an account of a fall such as would result in fracture of the arch of the fifth lumbar vertebra; but, above all, by internal examination, counting the bodies of the sacral vertebræ, and recognizing the projecting lumbar vertebra by finding the sacral vertebræ complete, and by the absence of the alæ in this, which belong to the first sacral. In Olshausen's case the bifurcation of the aorta could be felt on the deeply-sunken lumbar vertebral column.

The Cæsarean operation is unavoidable in a severe spondylolisthesis. Slight degrees of the deformity are much more common than was at first supposed, and the prognosis is, according to Zweifel, no more unfavorable than it is in the flat rachitic pelvis.

In case the lumbar vertebræ are felt by internal examination, this lordosis can only be explained as caused by rachitis, pelvis obtecta simplex, or by spondylolisthesis. Palpation and counting the sacral vertebræ while the woman is lying upon her side are of special importance.

The Pelvis Flattened from Bilateral Dislocation of the Femoral Bones.

—Whether the double dislocation be congenital or occur early in childhood, the heads of the femurs pressing above and posteriorly to the acetabula, great traction is exerted upon the round and upon the ilio-femoral ligaments; the muscles of rotation passing from the inner side of the pelvis to the femur, the obturators, and gemelli, are also made tense. Hence traction in a transverse line at the pelvic outlet and partial eversion of the pelvic outlet. By the tension of the ilio-femoral ligaments passing from the capsule to the anterior inferior spinous process, and in consequence of the place of support of the trunk, the heads of the femurs, being placed farther back, the centre of gravity is thrown anterior to the plane of support; continual care is necessary to prevent falling forward, and this is exerted by the dorsal muscles drawing the body backward, the consequence of which is the inclination of the pelvis is lessened, and there is a lumbar lordosis. Tension upon the pelvic ring causes increase in the transverse diameter of the inlet and flattening of the pelvis, with necessary shortening of the conjugate; the latter diminution is also increased by sinking of the sacrum. Not only the conjugate is lessened, but usually the corresponding diameters of the cavity and of the outlet, though, according to Kleinwächter, this lessening becomes less at the outlet in consequence of the recession of the lower part of the sacrum, while, on the other hand, it may be that, resulting from tension upon the ligamentous connections between the ischial tuberosities and spines upon the lower portion of the sacrum, the latter is drawn forward, and then there necessarily follows lessening of the antero-posterior diameter of the outlet.

The true conjugate rarely falls below nine centimeters, but in some it has been reduced to seven. The characteristics of this pelvis are, in addition to the lessened conjugate, the increase of the transverse diameter, the fact of the double luxation, the greater breadth of the pubic arch, the lessened pelvic depth, and the flattening of the pelvic inlet. The diagnosis in the living subject is greatly facilitated by observing the duck-like gait. The anomaly of the pelvis, if we know the peculiar walk of those having such a basin, Zweifel states, can be diagnosed at a distance of two hundred steps.

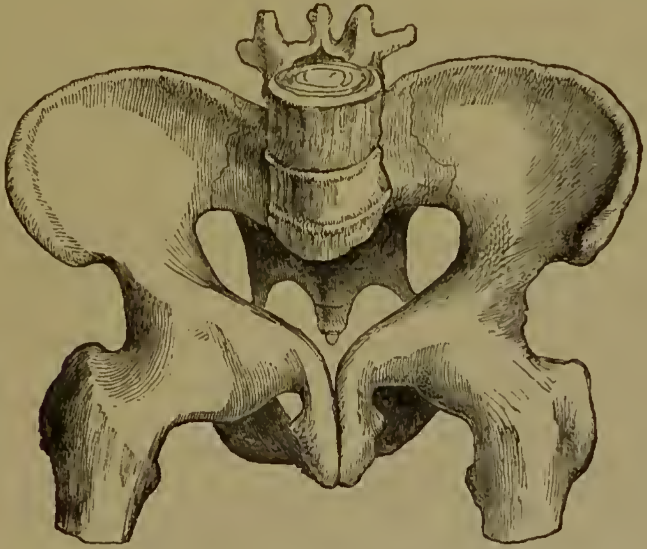
This pelvic deformity is quite rare; according to Kleinwächter, only nine of such pelves have hitherto been observed. The labor usually ends favorably both for mother and child; after the head once passes the inlet the progress is quite rapid.

The Second Class, that in which the Pelvis is chiefly Narrowed in its Transverse Diameter.

(*a*) *The Osteomalacic Pelvis.*—Osteomalacia (from *οστεον*, bone, and *μαλακος*, soft—mollities ossium, softening of the bone) is a disease of which the essential cause is a diminution of the earthy salts of the bones, this diminution being such that these salts are two, three, or even five times less than normal, and of which the most marked results are changes in the forms of the bones in consequence of their great flexibility. It is not a disease belonging exclusively to adult life nor to the female nor to childbearing. Nevertheless, the statistics of Collineau indicate very clearly the frequent origin of the disease in consequence of changes of the organism caused by pregnancy. He found only 14 of 43 women suffering with osteomalacia who had never been pregnant, and of the other 29, 14 who had had from four to ten pregnancies, 6 one to three, and 4 who had been pregnant but once. Nevertheless, as these statistics prove, the majority of cases of the disease are connected with pregnancy. It may appear during gestation or in the puerperium ; once begun, the disease is aggravated by succeeding pregnancies, especially if the intervals are short.

It is impossible to satisfactorily explain the anomaly of nutrition which is essential to the disorder. "While true that the disease has never been observed in women comfortably situated in life, even the lack of good nourishment, miserable and damp dwellings, a diet exclusively of potatoes or of rice, cannot be regarded as the absolute cause of the disease, though the conditions just stated are undoubtedly predisposing causes. If deficient nourishment of the bones in the large majority is the sole cause, so that the bones, losing their earthy elements, are softened, then osteomalacia would be much more frequent. A fact that is inexplicable is, that the disease occurs usually only rarely and sporadically, but in some countries very frequently, so that it may

Fig. 284.



Osteomalacic Pelvis, showing the beak-like shape of the pubes.

be called endemic; thus it is found on the banks of the lower Rhine and in the adjacent valleys, in East Flanders, and on the plains of the Po." The fact of its frequently being seen in India has previously been stated.

The changes in the spinal column and in the pelvis result from softening of the bones affected by pressure and by traction. The spinal column, corresponding to its normal curvatures, is pressed by the weight of the body, and hence follow kyphoses, kypho-scolioses, and lordoses. The weight of the body causes by its pressure upon the sacrum pushing of the promontory downward and forward, and the sacrum draws anteriorly the posterior halves of the ilia, so that they are bent. The sacrum is narrowed, especially from lessened expansion of the alæ, and it is also bent forward. The pressure from the femurs forces the acetabula and adjacent parts inward and upward, so that the pubic joint and horizontal rami are pressed forward, the rami becoming parallel and proximate, so that the ilio-pectineal eminences are adjacent. The illustration given shows the beak-like projection of the pubic joint —pelvis rostrata. The pubic arch almost entirely disappears, and while the antero-posterior diameter of the inlet may be increased, the available space is seriously lessened. The pressure upon the acetabula always makes the outlet less than the inlet.

In making the diagnosis of deformity of the pelvis from osteomalacia, the history is of great importance; for example, the period when the disease was first manifested—just following pregnancy; the severe pains felt—tearing and drawing, mistaken in some cases for violent rheumatism. The patient's walk is characteristic, for in consequence of the approximation of the acetabula the femurs are brought near, and she is compelled at each step to turn on one foot while the other is thrown around and in front of it. Those affected with the disease are small, and as it progresses they grow smaller.[1]

The bistrochanteric diameter is lessened; the external conjugate is not lessened in all cases, but the promontory is always accessible, the narrowed pubic arch and the approximated horizontal pubic rami giving a beaked form to the anterior portion of the pelvis; and finally the diminished outlet will be more or less readily recognized. Further, half or the entire hand may be introduced into the pelvis, when the fact and the extent of the deformity can be better appreciated; during such examination possibly there may be ascertained that the bones are quite flexible; and this fact would make the prognosis as to delivery more favorable.

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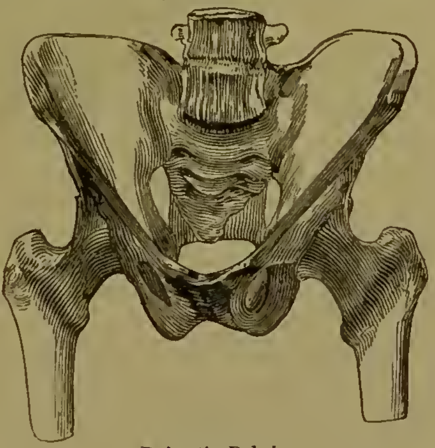
[1] In regard to the effect of osteomalacia upon the stature, two of the most remarkable stories are told by French authorities. Thus, in the year 1700, Lambert published the case of the marquise Bernard of Armagnac, who died when twenty-two years old, the stature having been lessened at least one foot, and in whom all the bones, except the teeth, were softened. But, according to the report of a monk, Abbon, there was in Paris during the Norman siege in 886 a man who was very tall, but who before dying became smaller than an infant.—*Dictionnaire encyclopédique des Sciences médicales*, article "Osteomalacie," by Albert Hénocique.

A general rule in regard to the conduct of labor in a case of osteomalacic pelvis is not to interfere too early, for the bones may prove so yielding under uterine contractions that the passage for the fœtus is opened, and thus a threatened Cæsarean section or embryotomy be averted.

(*b*) *The Ankylotic Transversely-contracted Pelvis.*—The first pelvis of this kind was described by Robert in 1842. Its origin seems to be in an arrested or imperfect development of the sacrum, followed by ankylosis of the sacro-iliac joints. The alæ of the sacrum are absent or only imperfectly developed; the sacrum is narrow, and has descended deeply between the ilia; the ischial tuberosities and spines approach. The antero-posterior diameters of the pelvis are normal or increased, while the transverse are much lessened; especially is the transverse of the outlet reduced. According to Kleinwächter, in the cases hitherto observed the transverse of the inlet varied from 7 to 10 centimeters (2.7 to 3.9 inches), and that of the outlet from 2.25 to 6 centimeters (0.8 to 2.7 inches).

Fig. 285.



Robert's Pelvis.

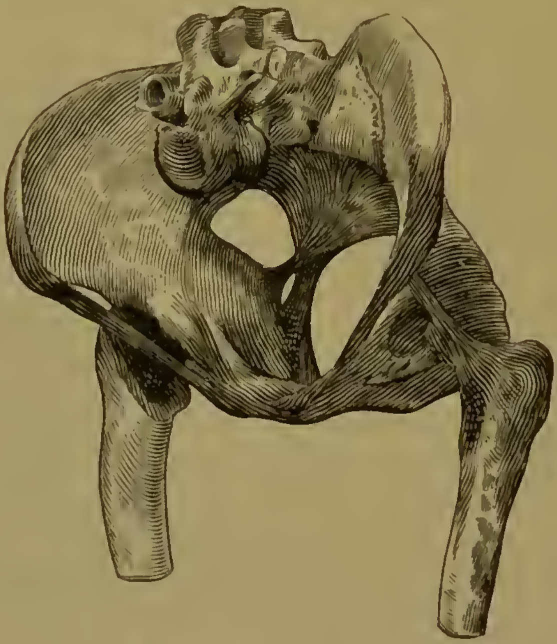
The symmetrical character of the deformity, each side of the pelvis being equally involved, leads to the rejection of its origin in any case in disease of the sacro-iliac joints, but this exclusive source is made in a congenital absence of ossification-centres in the sacral alæ; nevertheless, traces of inflammation of these joints have been found in some instances of this deformity.

The diagnosis is made by the narrowed pubic arch, the parallelism of the horizontal pubic rami without any abrupt bending of these bones which is observed in the osteomalacic pelvis, and chiefly by the great narrowing of the sacrum. This is a very rare anomaly, only nine cases having been observed. In six of the nine the Cæsarean operation was done. In two cases in which the transverse diameter of the inlet was 8 centimeters (3.1 inches), and that of the outlet 5.25 centimeters (2 inches), delivery was effected by cephalotripsy, and this is, therefore, regarded as the limit of its applicability.

(*c*) *The Kyphotic Transversely-contracted Pelvis.*—Kyphosis (*κυφωσις*, applied by Hippocrates to a bowing or curving of the spine, so that one was humpbacked) means an abnormal convex curvature of the spine.

The origin of the kyphotic pelvis is found in an abnormal posterior spinal curvature, for a compensating curvature lower down results from the former; and in order that the pelvis may be affected by the spinal anomaly, the latter must be situated in the lumbar vertebræ, or in these the sacral vertebræ must be affected, the one known as lumbo-dorsal, the other as lumbo-sacral, kyphosis. Further, the sacrum is pushed downward and backward: just as in a pelvic deformity previously considered this bone is pressed downward and forward, lessening the conjugate, a rotation of the bone upon its transverse axis forward, so that the sacral promontory is brought nearer the pubic joint, so now a corresponding rotation backward is claimed to occur. Some of these points may admit of dispute, as will be seen when we refer to the recent investigations of Barbour.

FIG. 286.



Lumbo-sacral Kyphosis (Mütter Museum, College of Physicians, Philadelphia).

From this author we quote the following summary of the peculiarities of the kyphotic pelvis based upon his examination: "The iliac crests are drawn out from before backward; the arching of the crests is diminished and their sigmoid curve lessened. The anterior superior spines are thrown apart. The pelvis is funnel-shaped. The conjugate diameter is greatly increased, while the transverse is relatively, and sometimes absolutely, lessened. The linea terminalis is less arched at the sides. In the cavity the conjugate is increased, but to a less extent than at the brim. Sacrum narrowed transversely and elongated vertically; its vertical curvature is diminished throughout its transverse in the upper portion of the bone. At the outlet the conjugate is not usually altered. The transverse may be contracted, and that to an extreme degree. The pubic arch is narrowed."

The most characteristic anatomical peculiarity of the kyphotic pelvis is an increase in the antero-posterior diameter of the brim. The contraction in the transverse diameter of the outlet, which is the feature of obstetric importance, is not so constant.

Further, Barbour, in opposition to the teaching of Breisky, states as the result of the study of the preparations he has had that there is not, as a rule, a rotation of the sacrum upon a transverse axis, and that the contraction at the outlet is not related to the elongation at the brim. He further maintains that the contraction at the outlet implies a rotation of the innominate bones; and this is shown by the fact that the approximation of the tuberosities is related to separation of the crests.

The most characteristic indication of the kyphotic pelvis is found in the presence of a lumbar kyphosis, and next in the peculiar walk of the subject, the movement being as if carrying some heavy load before her and a constant effort to avoid falling. By pelvimetry we find the true conjugate increased; the transverse measurements of the false pelvis are normal, but that between the posterior iliac spines lessened.

The distinction just given is the direct opposite of the conditions observed in the osteomalacic pelvis, with which this may be confounded, for in that the anterior transverse diameters of the false pelvis are lessened, while the distance between the posterior iliac spines is increased. The pubic arch is narrowed in the rachitic and also in the osteomalacic pelvis, while no narrowing is present in this. Besides, the first two occur in persons whose history points to one or the other disease. In such pelves, too, the promontory is quite accessible.

Of course the prognosis rests chiefly upon the degree of contraction. It is of especial importance in this connection to know the transverse diameter of the outlet, and this is best done by Chantreuil's method. (See p. 728.) Further, it is important to know if "the ischial tuberosities move upon being pressed apart. Korsch has demonstrated that even in the normal pelvis the transverse of the outlet can be thus slightly increased, this movement being accompanied by a diminution in the conjugate."[1] But before this observation both Mattei and Laborie have asserted that an increase in the transverse diameter of the outlet resulted from the wedge-like pressure of the fœtal head.

In consequence of the lessened abdominal capacity arising from a lumbar kyphosis, the uterus may be strongly anteverted, and hence difficulty in the head entering the inlet. But the most frequent fact as to the position of the child in the abdomen that has been observed is that the fœtal back is posterior—that is, toward the mother's spine—

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[1] Barbour: *op. cit.*

"probably in consequence of the pendulous abdomen generally present, the limitation of abdominal space, and the compensating lordosis of the upper portion of the spinal column, through which the anterior plane of the fœtus can be better adjusted to the anterior abdominal wall." This explains the frequency of occipito-posterior positions. According to Barbour, the shape of the pelvis favors posterior rotation of the occiput; that is, rotation into the pelvic cavity.

Barbour gives a table of 32 cases of kyphosis and 52 labors; there were 33 recoveries from these 52 labors, but of the 32 mothers, 19 ultimately died after labor. He thus finds in his collection of cases that there was a fœtal mortality of 52 per cent. and a maternal mortality of 36.5 per cent., according to the number of confinements, or 59.4 per cent., according to the number of cases of kyphosis.

The extreme limit admitted by Barbour for the application of forceps is 3.25 inches, and if this diameter is less he advises craniotomy. There were 7 cases of Cæsarean section, 6 mothers dying; 9 cases ended spontaneously, and 7 mothers recovered. Zweifel regards the prognosis as more favorable in that than in other pelvic contractions, because the narrowing is at the outlet. But he adds that Cæsarean section has been necessary, and as spontaneous rupture of the uterus has occurred, and even after the use of the forceps death rapidly followed, it is advisable in a given case to keep this possibility in mind.

Rachitic Kyphosis.[1]—While the changes in the pelvis caused by rickets are in the main directly opposed to those caused by kyphosis, on the other hand, should kyphosis result from rickets, the pelvis may present a similar form to that observed if the kyphosis has a different etiology. The kyphosis, in order to change the form of the pelvis, must, as in the account of the kyphotic pelvis just given, concern the lumbar vertebræ. The diameters of the outlet are lessened, and the diminution is greatest in the antero-posterior.

The Third Class includes Pelves chiefly contracted in the Oblique Diameter.

(*a*) *The Ankylotic Obliquely-contracted Pelvis.*—Dionis was credited by Naegele with having first alluded to the pelvis contracted in an oblique diameter. Certainly, this distinguished French accoucheur does refer to difficult labor caused by spinal deformities, and also to changes in the pelvis caused by rachitis, but his reference to the pelvis now to be considered is by no means clear.

The oblique-oval, or Naegele's basin, was first described by Naegele in 1839. It is distinguished by the fact that one sacro-iliac synchondrosis has been ossified, and as a consequence one-half of the basin becomes narrower.

The part of the sacrum belonging to the ankylosed side is imperfectly developed, and its union with the innominate bone is made by a narrow ledge of greatly condensed osseous tissue instead of by a broad articulating surface. There is slight scoliosis involving the lumbar vertebræ. In Kleinwächter's case there was also rachitis. The iliac bone of the affected side is raised and projects farther back than its fellow. The sciatic notch is lessened in consequence of the ischium being pressed upward and inward, and the ischial tuberosity and spine approach the sacrum.

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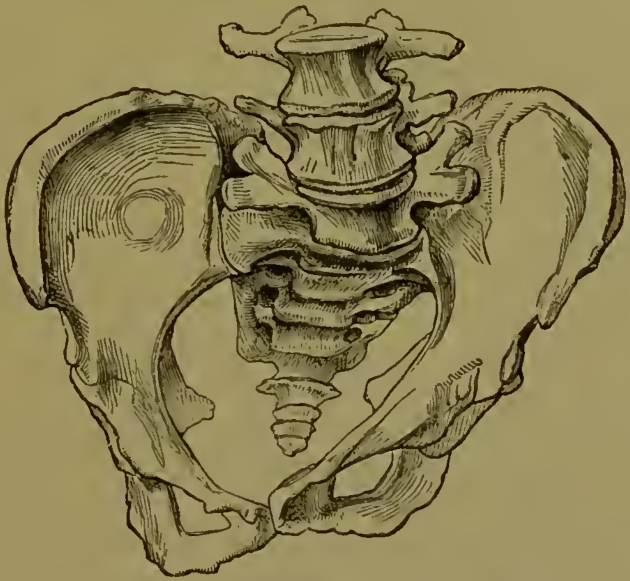
[1] *Zweifel.*

Fig. 287.



Obliquely-distorted Pelvis, or Naegele's Pelvis.

The absence or rudimentary condition of the sacral wing upon the affected side finds its most rational explanation in the absence of ossification nuclei, and therefore the deformity may have an intra-uterine origin: this was the view favored, though not exclusively adopted, by Naegele. But it is also held that the deformity may result from pathological conditions of the joint in infancy or childhood; in other words, inflammation lies at the beginning of the change. The theory of an inflammatory origin in some cases after birth does not exclude that possibly this inflammation may begin in intra-uterine life; if the inflammation occurs after being born, its cause may be simply pressure of the trunk, which will be greater upon that side corresponding with an imperfectly developed sacrum. It is impossible for disease of one of the sacral joints in adult life to cause the deformity.

Thomas[1] in 1861, from a study of the 50 cases of oblique oval basin up to that time described, classified them as to their etiology as follows:

(*a*) Oblique pelves found in women who during their infancy, or in all cases before the ankylosis was recognized, had suffered from disease of the pelvic bones, 9 cases.

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[1] *Das Schrägverengte Becken*, quoted by Naegele and Grenser.

(*b*) Oblique basins with fracture of the pubis on the same side as the ankylosis, 2 cases.

(*c*) Oblique basins with traces of periostitis or exostoses of the hip-bones, 3 cases.

(*d*) Oblique basins in which there was found, besides the ankylosis, a coxal arthritis of the same side or of the opposite side, 5 cases.

(*e*) Oblique basins without any other trace of disease, of which, nevertheless, the history was too imperfectly known to permit the absolute statement that in the women to whom these pelves belonged there was nothing observed, especially in youth, indicating a morbid state of the pelvic bones, 27 cases.

(*f*) Oblique basins without visible traces of disease of the pelvic bones in women whose history was sufficiently well known, so that it could be affirmed they had never suffered from any affection of the bones.

Whatever or whenever the origin of the deformity, the latter presents a most characteristic form which is well shown in the illustration that has been given. The pelvic inlet is asymmetrical, and presents the form of an obliquely placed oval with a point projecting to the ankylosed side. The antero-posterior diameter is increased, but the transverse is lessened, and there is a continued lessening of this diameter through the cavity and to the outlet.

Kleinwächter thus describes the changes in the basin conditioned by imperfect development of one-half of the sacrum: The sound side of the pelvis is developed, and grows normally both anteriorly and posteriorly. Its ilium is curved, because by the firm attachment of the sacro-iliac ligament to the posterior superior spine the growing wing of the sacrum exerts a strong pressure against the auricular surface. But, as on the other side a less pressure is exerted by the less developed half of the sacrum upon the innominate bone, the ilium remains flatter. Further, in consequence of the same imperfect development of this half of the sacrum, the corresponding sacro-iliac ligament is weak, less strong than that of the healthy side, and therefore the stronger one draws the pubic symphysis toward it, for this joint is always turned toward the sound side. As soon as the person with such a pelvis walks, the promontory and the two acetabula being subjected to increased pressure, the diseased half of the pelvis has to endure a greater pressure than the sound side, because the head of its thigh-bone is nearer the line of gravity. The ankylotic half of the sacrum is forced deeper in the pelvis, and the corresponding ilium moves upward and inward, the change beginning at the acetabulum. In consequence of the great pressure from the head of the femur the ilium is placed more vertically; the crista and linea innominata are higher, the ischial spines and tuberosities come nearer the sacrum. Finally, in consequence of the increased pressure, the osseous material in the vicinity of the ankylosis becomes more dense.

Most of the cases of obliquely-contracted pelvis have been diagnosed after death; the entire number of cases observed is given as about fifty, but probably this is too small. Zweifel states that with a great difference between the two sides of the pelvis the diagnosis during life cannot be difficult. Should there be delay during labor in the entrance of the head into the pelvis, the possibility of this deformity will be suggested if we find it impossible to reach the sacral promontory. The limping gait of the subject may not be observed, but it is important to learn whether there is any history of inflammation of the joint in infancy or childhood, and whether any evidences of suppuration following such inflammation can be found in healed sinuses. Freund claimed that, an examination being made per rectum, the woman standing alternately on one and then on the other foot, some movement would be detected in an unaffected joint, while the ankylosed one would be immobile.

Internal examination should be made with the half or with the whole hand, and thus the want of correspondence in the position of the ischial spines, the distortion of the promontory, and the displacement of the pubic joint will be learned. The most important external measurement in order to prove that the basin is asymmetrical is the distance between the trochanter major of one side to the iliac crest of the other, and *vice versâ*. Naegele directed the following measurements to be made:

1. From the posterior superior spine of one side to the anterior superior spine of the other side—from the right side behind to the left side in front—normally 21–22 centimeters.
2. From the trochanter major of one side to the posterior superior spine of the other—22.25 centimeters.
3. From the middle of the inferior margin of the pubic joint to the posterior superior spine of each side—17.25 centimeters.
4. From the ischial tuberosity of one side to the posterior superior spine of the other—17.5 centimeters.
5. From the spinous process of the last lumbar vertebra to the anterior superior spine of each side—18 centimeters.

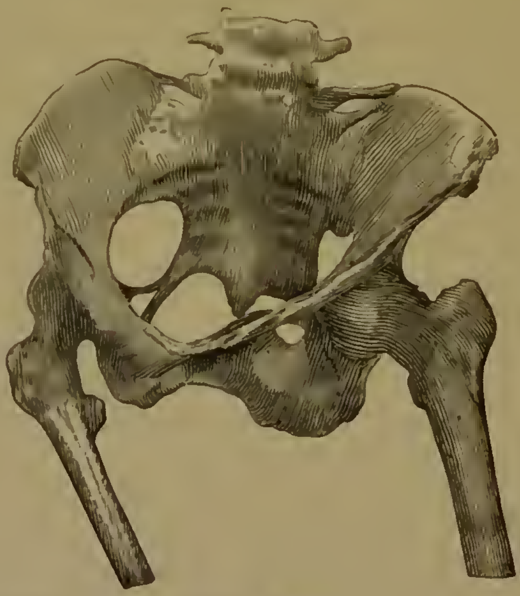
These oblique diameters, as Naegele termed them, must show a difference between each two corresponding ones of more than one centimeter in order to make the diagnosis of obliquely-contracted pelvis.

In this pelvis, if the ankylotic contraction be great, the passage of the child is necessarily made through that portion of pelvic space corresponding to the healthy side, for that which belongs to the ankylotic side is so contracted that no part of the fœtus can be admitted. The space, then, that is available is quite similar in form to that given by the justo-minor pelvis; and if labor be possible the mechanism is the same, the occiput descending first, as has been described in the course of labor occurring in that pelvis. Presentation of the breech is very unfavorable, because of the great difficulty in, or impossibility of, the passage of the head.

The prognosis as to the mother of course depends upon the degree of the deformity, the vigor of labor-forces, the size and degree of resistance to moulding of the fœtal head, and the size of the child: the maternal mortality given by Litzmann and Thomas is 80 per cent. But this high percentage is to be attributed to the fact that in most of the cases the deformity was not recognized soon enough for the use of appropriate therapeutic means, and in some instances, according to Kleinwächter, the means employed directly caused the death of the mother. Zweifel, too, regards Litzmann's statistics as being too unfavorable. He advises the forceps if the head enters the pelvis, but if this entrance be impossible the Cæsarean operation, especially as in cases of such difficulty uterine rupture is liable to occur.

(*b*) *The Coxalgic Obliquely-contracted Pelvis.*—This pelvis is similar to that just described, but there is this remarkable difference in manifestation. Thus while in the Naegele pelvis the arrest of development or the inflammation of the sacro-iliac joint affects the side of the basin in which it occurs, in this deformity the coxitis and subsequent ankylosis are upon the side of the pelvis which remains comparatively nor-

FIG. 288.



A Coxalgic Obliquely-contracted Pelvis (Mütter Museum, College of Physicians, Philadelphia).

mal, and the healthy side becomes misshapen. The pelvis above represented was taken from a negress upon whom Dr. R. G. Curtin performed Cæsarean section, and it exhibits very clearly the fact of the pelvic deformity being manifest upon the healthy side, while that upon which the coxitis occurred is normal. The history of the usual development of this pelvis is that a child suffers from coxitis so severely that the corresponding lower limb—for example, let the affection be upon the right side—becomes useless, and the weight of the body rests upon the left femur. This pressure causes similar changes in form in the basin to those observed in the Naegele. The left acetabulum is pressed upward, and it comes more in front; the innominate line is bent in front at an acute angle, and the left ilium is higher and less inclined; the left half of the sacrum is narrowed, so that the entire bone loses its symmetrical form; the left ischial tuberosity and spine move backward and outward, and the pubic joint is placed opposite the right side.

There are several modifications of the coxalgic oblique basin according to the period in adolescence when the disease of the joint began and as to the degree of use permitted by the diseased limb. Thus, the earlier in childhood the disease occurs and the more the limb is used, the greater the deformity. On the other hand, if the coxitis is first manifested after complete development of the basin, the obliquity may be completely absent.

So, too, the obliquity may involve first one side, and then it may change to the other. Zweifel gives the following illustration: A child has coxitis of the right side, ending in firm ankylosis, the right lower limb being shortened. It necessarily limps, and the concussion in walking will be greater than on the left side, this jar being felt not only at the hip-joint, but also in the corresponding sacro-iliac synchondrosis; hence, ascension of the iliac bone. If now a chronic inflammation in the sacro-iliac joint is superadded, the corresponding sacral wing will be retarded in its growth; hence the right half of the pelvis becomes smaller than the left half, the pubic symphysis is pushed to the left, and the oblique diameter of the pelvis from the left anteriorly to the right is shortened. Suddenly, however, all this may be changed, so that by muscular traction a pelvis presenting an opposite contraction may be developed. For if the child ceases to use the right lower limb, the plane of support is exclusively given by the left femur. But it is not necessary to follow the changes that then result in the form of the pelvis, the diseased side furnishing comparatively a normal condition of the corresponding side of the pelvis, and the healthy side becomes in this regard abnormal.

Paralysis of a lower limb or amputation of a leg is rarely followed by any great change in the form of the basin, because in the great majority of cases this has attained complete development before either occurs.

The coxalgic pelvis so gravely deformed as seriously to interfere with labor is rarely seen. The recognition of the deformity will be made, first, by having a history of coxitis in early life, and finding its effect in a useless abdominal member, and then by direct examination of the pelvis. In slight cases of the deformity labor needs no assistance, while in the grave ones labor and its treatment are the same as advised in similar circumstances in the Naegele pelvis.

(c) *The Scoliotic Obliquely-contracted Pelvis.*—This deformity arises from a scoliosis involving the lumbar vertebræ, there being thus caused a greater pressure upon that half of the upper articulating surface of the sacrum corresponding with the side toward which the spinal curvature occurs. By the connection of the sacrum with the innominate bone this increased pressure is transmitted to the femur of that side. But the resistance of the latter causes leaning inward of the parts adjacent to the acetabulum, and hence that side of the pelvis becomes greatly lessened. A scoliosis of the vertebræ toward the right diminishes and deforms the right half of the pelvis, while the left is similarly affected by a scoliosis with its curve directed to the left.

Should the scoliosis be limited to the dorsal vertebræ, a compensating curve of the lumbar vertebræ may prevent any influence upon the pelvic form.

This deformity renders one side of the pelvic canal useless, so far as furnishing space for the transmission of the child. The mechanism of labor is that described as occurring in the justo-minor pelvis, and the assistance to be given by the obstetrician, provided the contraction be not so great as to forbid the passage of a living child, is by forceps, remembering, however, that this instrument is not to be used until the head has been sufficiently moulded.

DEFORMITIES OF THE PELVIS CAUSED BY FRACTURES OR BY NEOPLASMS OF THE PELVIC BONES.—Fracture of the horizontal ramus of one of the pubic bones may result in serious deformity of the pelvis, because of the impossibility of keeping the broken ends of the bone in apposition during healing. Eugène de Saint-Moulin[1] narrates the case of a girl sixteen years of age who while working in a coal-mine was injured by the falling of a large mass of coal upon the lower portion of her back: after several months she recovered so that she could walk, though with some difficulty, and there was slight spinal deformity. Five years afterward she became pregnant, and the diameter of the superior strait being only three centimeters six millimeters, the Cæsarean operation was successfully done at the end of the pregnancy. Seven years after she was again pregnant, and at seven months rupture of the uterus occurred, the tear being in part of the uterine incision made in the previous operation, and the rupture ended fatally. The autopsy showed that, in addition to marked lumbar lordosis, the second sacral vertebra was crushed, so that the first was directly buried in the pelvic cavity, and there was a synostosis between its inferior border and the superior border of the third sacral vertebra. The spondylolisthesis had thus a very rare origin in this case.

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[1] *Journal d'Accouchements*, 1885.

Various neoplasms—enchondroma, sarcoma, carcinoma, exostoses, fibroma—may, originating from any part of the internal surface of the pelvic bones, encroach so greatly upon the bony birth-canal that the Cæsarean section is necessary.

Deventer, who was the first obstetrician to give any clear exposition of pelvic deformities, regarded the position of the coccyx in certain cases as furnishing a serious obstacle to labor, and devoted several pages of his well-known work to the consideration of this topic, giving explicit directions as to the method of pushing the bone back and thus enlarging the pelvic outlet. Some other obstetricians since have also regarded sacro-coccygeal ankylosis as an obstacle to be obviated by the obstetrician. But probably the truth is that in case of this ankylosis the pressure of the child's head is quite sufficient to overcome the resistance, breaking the synostosis, and there is no necessity for obstetric interference.

ANOMALIES OF THE FŒTUS.

Fœtal anomalies causing dystocia may be conveniently classified as those of size, of presentation, of position, and of form in case of single pregnancy. But if the pregnancy be pluriparous, difficulties may occur when the twins, for example, are separate or when they are united, there resulting in the latter case what is termed a double monstrosity.

ANOMALIES OF SIZE.—It is proposed to consider under this head only those cases in which there is excess of development of the fœtus, the increase in size being physiological, reserving for another section those instances of perversion or of arrests of development, and pathological conditions, as, for example, œdema, emphysema, effusions in serous cavities, and neoplasms.

It is usual, in case the pregnancy be prolonged some days beyond the normal term, to find the fœtus of greater size than the average. Some women, too, though their labors are at the normal period, give birth to children whose great development presents a more or less serious obstacle to labor, and stillbirths are not unfrequent. It sometimes happens that advanced ossification of the bones of the head prevents their normal flexibility and mobility, and hence a favorable moulding of this part adapting it to the birth-canal: thus, spontaneous labor may be rendered impossible, and even craniotomy necessary.

Occasional instances of excessive, even of enormous, development of the fœtus have been reported from time to time. Thus, Kormann refers to a labor in which the child presenting by the breech was still-born and weighed 9.8 kilograms.

It is impossible in most cases to make the diagnosis of excessive size of the fœtus with absolute certainty during pregnancy; but during labor and after the rupture of the membranes we can, supposing that the presentation is cranial, ascertain by the slow descent of the presenting part notwithstanding vigorous uterine contractions, by the lessened convexity of the bones that can be felt and by their greater resistance, and by abnormal increase in the distance between the anterior and posterior fontanelles, that the head is of unusual size.

Essentially, the labor presents the same characteristic as that of labor in a generally contracted pelvis; there is the same loss of harmony of relation between the passenger and the passage in one as in the other. So, too, the same general plan of treatment is applicable during most of the labor. Thus, in case the delivery of a living child is possible, the obstetrician waits until the head has been by Nature's efforts given suitable form for transmission, and then, if necessary, applies the forceps.

It not unfrequently happens, however, that in these cases, after either the spontaneous or artificial delivery of the head, the shoulders will not pass through the outlet or through the vulvar orifice, and the life of the child is in instant peril: the difficulty in delivery is increased if the child has respired, for of course the size of the thorax has been thus made greater. In this emergency the obstetrician endeavors first to deliver by direct traction upon the head, made either by applying the hands to each side of it or two fingers of one hand under the chin and two of the other hand beneath the occiput. If this method fails, then let the head, supposing external rotation to have occurred, be carried backward toward the perineum, some traction being made; this step is taken in order to bring the pubic shoulder into the arch and cause it slightly to emerge, thus endeavoring to imitate the normal mechanism of shoulder delivery, for in that the partially-delivered anterior shoulder pivots upon the subpubic ligament, remaining fixed until the posterior shoulder is completely expelled; after the upper shoulder has become thus fixed the head is carried upward, when possibly the posterior will be born. Failure still occurring, we may push the anterior shoulder upward behind the pubic joint, and then by traction attempt to deliver the posterior shoulder. It should be remembered that in these and other efforts to deliver the thorax there must be as much assistance given as possible, not only by the voluntary efforts of the woman, but by compression of the uterus. Finally, other methods of traction having failed, we may make this by one or two fingers of each hand in the axillæ, or even by the blunt hook; the latter more especially is employed if the child be dead. It is to be remembered that axillary traction is very apt to be followed by temporary paralysis of the arm. In rare cases it may be necessary to open the chest and use the cephalotribe. So, too, in case the head is detained in the pelvic cavity because the great size of the thorax does not permit its entering the inlet, the cephalotribe, first to the head, and then to the chest, is indicated.

It is possible that in some cases in which the vulvar orifice is the only barrier to the delivery of the shoulders, and the difficulty cannot be overcome by the ordinary means, the child's life being in immediate peril, episiotomy would furnish the quickest relief.

Abnormal Presentations.—These may be simple or compound. The only simple ones that will be considered are those of the shoulder. The right or the left shoulder may present, and in either case the back may be anterior—this is much the more frequent—or it may be posterior, and hence there are two positions for each presentation. Shoulder presentations occur once in about 125 labors (Pinard), 6 to 7 times in 1000 labors (Kleinwächter). The causes of such presentations are smallness of the fœtus, its being dead, polyhydramnios, peculiar form of the womb, relaxation of its walls, relaxation of the abdominal walls, and hence uterine deviations, and pelvic contraction.

The diagnosis is made by auscultation and by abdominal palpation first, and then by vaginal touch. The maximum of intensity of the fœtal heart-sounds is heard in the median line below the umbilicus, and upon palpating the abdomen the fundus of the uterus is not found as high up as usual, but strongly inclined toward one or the other side, and the organ fails in length, but is increased in breadth; in a word, it does not present its normal form. Further examination shows that the head is in or near one iliac fossa and the breech upon the other side, the trunk, however, not placed directly across, but in an oblique direction, for it is impossible that the child can be transverse, the distance between the iliac fossæ being too short to measure the length of the fœtal ovoid at the end of pregnancy. Labor having begun, the non-descent of the fœtal presentation into the pelvis will create a suspicion that it may be the shoulder. After the part is accessible to touch it is recognized as the shoulder by its form, by the clavicle or scapula being felt, by the axilla and the ribs; the opening of the axilla points toward the breech, and thus we know whether the head is to the right or to the left, while the position of clavicle or scapula tells whether the back is posterior or anterior. After the rupture of the membranes descent of the arm not unusually follows, or, if there be doubt as to the presentation, this may be drawn down, when not only confounding it with a foot is impossible, but by examining the position of the hand we can know whether the back is anterior or posterior, for the dorsum of the hand is superior if the back is in front, but the palmar surface occupies such position if the back of the child is posterior. Further, by observing with which of the obstetrician's hands the palmar surface of the child's hand corresponds he knows whether the right or the left shoulder presents. It should be remembered, however, that the descent of a hand does not necessarily prove a shoulder presentation, for in some instances this member comes down in front of the head, or even of the pelvis, thus making a compound presentation; and therefore to avoid possible error the hand should be followed up until the part actually presenting is reached.

Spontaneous delivery is possible in one of three ways:

1. As Roederer first observed, the child being small and readily compressible, a lateral doubling of the body, *corpore conduplicato*, may occur, and the child, thus folded upon itself, is so compressed that it may be forced through the birth-canal.

2. Spontaneous version may occur. In presentation of the shoulder the uterus has taken an abnormal form, but if restitution of form occurs—that is, if the uterus takes its normal ovoidal shape—the fœtal ovoid is compelled to assume a corresponding position, and thus one or other of its poles, the cephalic usually, takes its place in the lower portion of the uterine cavity. This seems a more rational explanation than that which attributes the change of presentation to any irregular action of parts of the uterine muscular walls; there is simply a delayed but complete return of the uterus to its normal form, and the great law of accommodation, which plays so important a part in obstetric phenomena, is here manifested in the substitution of a normal for an abnormal presentation.

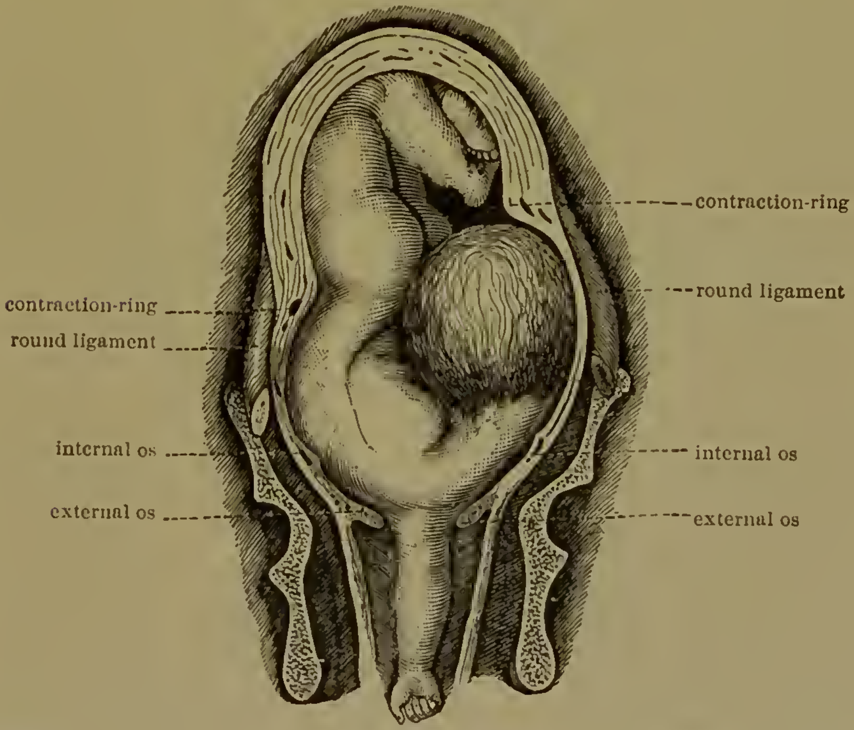
3. What is now designated spontaneous evolution may occur. This process was first described in 1811 by Dr. Douglas, a distinguished practitioner of Dublin, and called by him spontaneous expulsion, a more appropriate name than that which is now employed.

In the first variety of spontaneous delivery the head and body are delivered together, but in this the body is first expelled and afterward the head. The presenting shoulder passes so far down and out that it presses upon the pubic joint anteriorly, and is there fixed, while the body of the child, strongly compressed and flexed, is forced downward and out, the pelvis delivered last, the head meantime remaining in the pelvis; after the body has been expelled the head is delivered by the same mechanism as that occurring in an original pelvic presentation.

It must be obvious that both the first and second classes which have been given might be included under the general head of self-expulsion, but also that they differ in the process.

Whether we use the term spontaneous evolution or expulsion, or call it, with German obstetricians, Selbstentwicklung, according to Zweifel the process is so rare that only 10 cases were observed by Reike in two hundred and twenty thousand labors; Busch in 6180 only 2; Späth 5 in 15,523; Kuhn 9 in 17,375; and Arneth none in 6608: hence the obstetrician cannot trust to this method of delivery. The complication without the intervention of art at the proper time is a very grave one for both mother and child; the latter, from the long continuance of the labor and from the firm contraction of the uterus interfering with the placental circulation, or from direct pressure upon the cord, perishes with asphyxia, while the former is liable to rupture of the uterus, followed by dangerous hemorrhage or by septicæmia. The liability to rupture of the uterus arises from the continuance of uterine activity struggling against an invincible obstacle, with consequent thinning of the lower uterine segment, in some part of which the tear occurs. The accompanying illustration, from Schroeder, shows better than words can describe the condition of the uterus in neglected shoulder presentation and when rupture is imminent.

Fig. 289.



Shoulder Presentation: Threatened Rupture of the Stretched Lower Segment of the Uterus and Cervix.

The general indication in case of a shoulder presentation, so far as treatment is concerned, is to perform version, podalic rather than cephalic being usually selected, though really the latter can in many instances be successfully done and with comparative facility, especially by the method proposed and practised by the late Dr. M. B. Wright. But in some cases the very act of version may be the cause of the injury, or in others the tear has already occurred and the obstetrician receives the blame, and in still others version is impossible. As long as the membranes are unruptured there is no danger of uterine rupture, and therefore the obstetrician need not be in haste to intervene, but wait until full dilatation occurs, thus facilitating the operation. But after the escape of the waters delay is dangerous, for, as the labor-activity continues, the uterus closes round the child, the shoulder is driven deeply into the pelvis, the lower uterine segment is more and more thinned, the contraction-ring is felt farther up in the abdominal cavity —upon one side it is higher than upon the other—the round ligaments are tense, and rupture is at hand. The responsibility for the accident, as Zweifel states, then rests upon the obstetrician who has failed to perform version at the proper time.

Still another abnormal condition may occur in a shoulder presentation—a continued uterine contraction or tetanus of the uterus. Winter attributes this to the untimely administration of ergot or to mechanical irritation from mechanical causes; that is, from fruitless attempts at version. But, as Zweifel justly remarks, there may be tonic contractions of the uterus, as well as tetanus, without the administration of ergot or without any attempt at delivery, solely in consequence of premature rupture of the membranes.

The rule of practice, then, is to turn as soon after the rupture of the membranes as practicable, for if we wait until complete dilatation of the os occurs the dreaded accident may anticipate this condition. If uterine tetanus has come, we may try to abate it by chloroform and by the hypodermic use of morphia, but the child most probably is dead; the mother's life is in great and immediate peril, and its salvation may depend solely upon a prompt embryotomy.

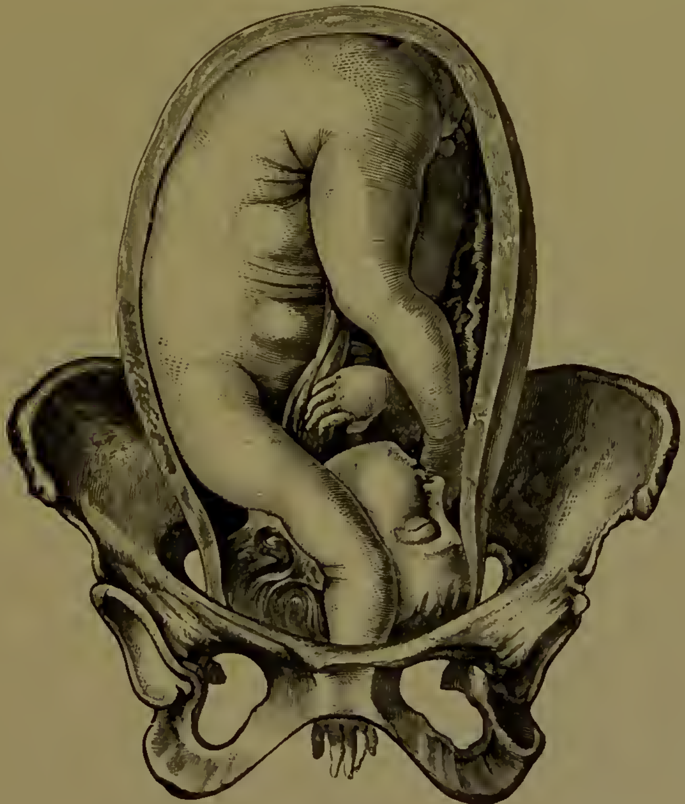
In some cases, even after the waters have been discharged for a long time, turning may still be possible, but the condition of the uterus ought to be carefully examined before we attempt this operation, lest we may cause by it the very result which we are seeking to avoid.

Compound Presentations.—By these are meant the descent with the presenting part of one or more unrelated parts. The descent of the arm in a case of shoulder presentation presents no complication, for these are related parts. But if such descent occurs with the head, the presentation is no longer simple, but compound. La Motte has related a case of labor in which the head, the hands, and one of the feet presented.

Madame Lachapelle[1] and all authors who have written upon the subject since have admitted as predisposing or occasional causes the small size of the fœtus, the abundance of the amniotic liquor, its rapid discharge, oblique presentation of the fœtus—when, for example, instead of being directed in the middle of the inlet, it is turned obliquely toward one side—and, finally, vices of conformation of the pelvis. Charpentier adds to these causes rupture of the membranes while the woman is standing, and unskilful or untimely efforts to perform version.

If the hand descends with the head—and this is the most frequent variety of the accident with which the practitioner will meet—the advance of the head is arrested, for it is impossible, unless the child is unusually small or the pelvis abnormally large, for the two to pass together through the birth-canal.

Fig. 290.



Hand Prolapsed by the Side of the Head.

The DIAGNOSIS after the rupture of the membranes presents no difficulty, and therefore need not be given. Should the diagnosis be made before this occurs—the obstetrician feeling a mobile, floating body presenting with the head, it is a matter of indifference whether hand or foot, so that discriminating between the two, often then difficult or impossible, is unnecessary—it is important that the woman lie down, and preferably on the side opposite to that upon which the member has been felt; especially is it important that she should be recumbent when the membranes rupture and the gush of liquor amnii occurs. In case the hand presents with the head after the amniotic fluid has passed off, the first endeavor should be to push it up, so that the head can descend alone. If this fails, podalic version is indicated. If a case should present the unusual complications which occurred in La Motte's, the method pursued by this wise obstetrician is to be followed; that is, push up the head, bring down the second foot, and extract the child by traction upon both feet.

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[1] Depaul.

ANOMALIES OF POSITION.—By these are meant those cases in which anterior rotation of the chin in presentation of the face, or of the occiput in that of the vertex, does not occur. There is, however, this important difference as to the necessity of anterior rotation of the chin in one, of the occiput in the other presentation: in the former such turning in front is absolutely needed in order that delivery can occur, but in the latter delivery is possible without the change referred to: it will be very tedious, it is peculiarly liable to be attended with injury to the perineum, and the delay in birth may cause the sacrifice of the life of the child; but still spontaneous or artificial delivery, without any mutilation of the fœtus, can occur, the occipital end of the head lever escaping over the anterior margin of the perineum.

In delayed anterior rotation of the chin with posterior of the forehead we may endeavor, by pushing upon one side of the forehead or by drawing with the finger upon the malar apophysis, to bring the chin forward. Penrose advises pressing with a single blade of the forceps or with the hand upon the posterior cheek. If pressure be made directly upon the forehead, not upon one of its sides, we thereby increase the extension and retard the descent of the part then foremost, and in so much facilitate that of the chin, and at the same time contribute to anterior rotation of the latter, for a mobile body subjected to a sufficient driving force and to two unequal resisting forces rotates in the direction offering the least resistance.

Various methods of effecting, or at least endeavoring to effect, anterior rotation of the occiput when this is turned toward one of the sacro-iliac joints have been proposed and tried: they are so well known that it is unnecessary to mention them here, only stating that they include the use of the entire hand or of one or two fingers, the employment of bimanual rotation acting upon each end of the fœtal ovoid, the method of Mattei, and rotating by means of the forceps. The principle previously mentioned as to effecting anterior rotation of the chin has its application here. But it is the desire of the writer to call especial attention to the value of Tarnier's forceps—not used for rotating, but simply to pull with—for when properly employed rotation of the occiput anteriorly is almost certain.

ANOMALIES OF FORM.

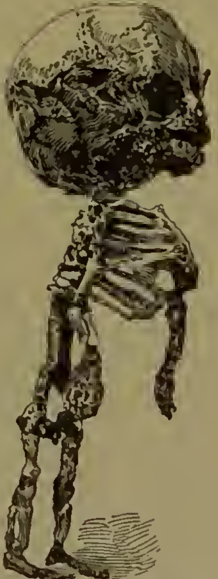
Under this head it is proposed to consider pathological conditions of the fœtus causing dystocia, as well as different malformations or arrests of development, whether of a minor character or so grave as to make the fœtus monstrous, that have a like result.

ANOMALIES CAUSED BY DISEASE OF THE FŒTUS AND ARREST OF DEVELOPMENT.—SINGLE MONSTERS.

Hydrocephalus, abnormal collection of serous liquid in the cranial cavity, first[1] fully described by Smellie in 1765, is not a frequent affection. Merriman's statistics gave 1 in 900; Lachapelle's, 15 in 43,545, or nearly 1 in 3000. Polyhydramnios frequently, but hydrorachis rarely, accompanies hydrocephalus. The great development of the head interferes with the normal accommodation of the fœtus, and hence there is a much larger proportion of pelvic presentations than when the fœtus is normally developed; Poullet[2] in 136 cases found 30 in which the pelvis presented. So far as the life of the fœtus is concerned, it seems to be well established that in no case in which artificial delivery was necessary did the child live, and therefore there should be no hesitation in lessening the size of the head. The mother is peculiarly liable to rupture of the uterus, as the statistics of Keith show; in one of Depaul's patients violent straining during expulsive efforts caused pulmonary emphysema, which was fatal.

The circumference of the head is, according to Spiegelberg, not rarely increased to 65–80 centimeters.

FIG. 291.



Skeleton of a Hydrocephalic Fœtus (Mütter Museum).

The DIAGNOSIS of hydrocephalus, should the head present, is made by the large size of the presenting part, by the wide intervals offered by sutures and fontanelles, by the bones being less convex, less firm, and more flexible than in the normal head; during a uterine contraction the scalp, instead of being wrinkled, remains smooth and tense, and there is no overriding of the bones. Combining digital examination with abdominal palpation, it is in some cases possible after the rupture of the membranes to perceive distinct fluctuation between the finger and the hand. In pelvic presentation a diagnosis is rarely made until the body is delivered, and then the arrest of labor from the difficulty of the enlarged head entering the inlet leads to careful internal and external examination, by which the cause of delay is learned. By palpation of the abdomen the uterus is found much larger than it ought to be after the expulsion of the child, and a large body is contained in it. The internal examination may permit touching the occipital bone, which presents the peculiarities previously mentioned as belonging to the bones of the hydrocephalic head; carrying the hand by the enlarged head for the purpose of disengaging an ascended arm, the distance is found very great, or the hand simply used for examination will learn some of the characteristic conditions of hydrocephalus.

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[1] See Hergott: *Des Maladies fœtales que peuvent faire obstacle à l'accouchment.*

[2] *De l'hydrocephalie fœtale dans ses rapports avec la grossesse et l'accouchement.* Peu (*op. cit.*) stated that the head of the child may be so filled with water or wind that it is impossible to introduce the hand, or even to employ any instrument to draw upon it, without first opening the head. Dionis (*op. cit.*) recognized the affection as hydrocephalus, and taught the necessity, in certain cases where the delivery was impossible, of puncturing the head.

The diagnosis is in some cases, however, quite difficult. Spiegelberg,[1] referring to the subject, made the following observations: "The widely gaping sutures and fontanelles are generally the most certain and easily recognized signs. But this condition is not always present. Complete cases of hydrocephalus occur in which the distended structures in the sutures are greatly ossified, and thus present no variation from the normal skull, and there are others in which the bones are not thin like paper, but are strong and thick, and fluctuation fails. On the other hand, skulls are sometimes seen having the usual size, but there has been delay in ossification, so that the sutures are wide. In doubtful cases the most reliable signs of hydrocephalus are the abnormal relation between the face and the brow (the latter being broad and prominent), the wide frontal suture, and the brow narrowing into the face. If, on account of the high position of the presenting part, we cannot accurately explore the head by touch, or if the child presents by the breech, we are confined to the evidence obtained by external palpation and the presence of a large and yielding head, which, of course, it is not always easy to make out."

In pelvic presentation the child probably has lived until its progress has been arrested at the inlet, and the obstetrician by pressure and traction vainly endeavors to make the head pass, and during these efforts witnesses the child's death.

The mortality to the mothers is, according to the statistics of Poullet and Spiegelberg, about 25 per cent. Nevertheless, the prognosis thus given is too unfavorable, for if there be no complications—such as placenta prævia, for example—if the hydrocephalus be recognized soon enough to prevent one of the most frequent accidents attending it, rupture of the uterus, proper means of course being taken to prevent such a result, recovery would probably be the rule, and very few exceptions occur.

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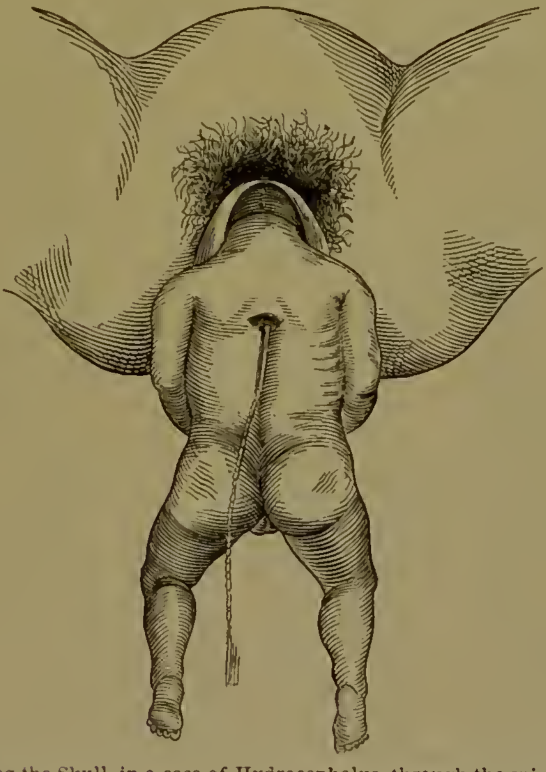
[1] *Op. cit.*

The TREATMENT immediately demanded in all cases in which labor is materially delayed by hydrocephalus is puncture of the head, and then, if the labor does not end spontaneously, delivery by traction from within or from without the head: the fingers, the crotchet, or a rod of wood two inches and a half long, to which a strong piece of cord is attached at the middle, slipped into the cranial opening, then placed transversely, may be used for traction, or forceps carefully used, or the cephalotribe. Some have advised turning the fœtus after puncture of the head, but this is unnecessary, and in some cases impossible because of the retraction of the womb around the fœtus.

In cases of pelvic presentation there is danger of dragging the body away from the head in the attempt to bring the latter through the pelvic inlet: that accident has happened more than once, and instances may be found in the pages of Mauriceau and La Motte. If, then, the fœtus cannot be delivered by moderate traction conjoined with suprapubic pressure, it is better to lessen the size of the head by puncture. Per-

FIG. 292.



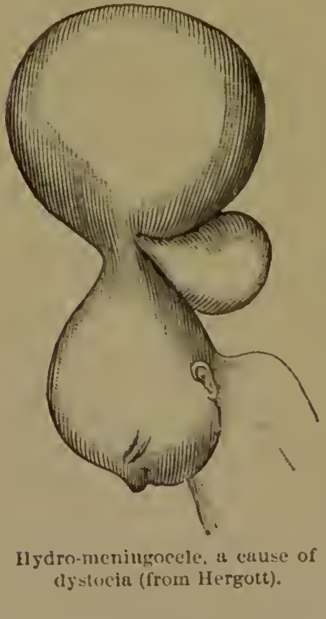
Evacuating the Skull, in a case of Hydrocephalus, through the spinal canal.

foration has been made through the palatine vault, at the occipital bone, behind the ear, or through a lateral fontanelle. The difficulty, almost insuperable in some cases, of reaching the head with a suitable instrument, led Van Huevel to suggest the following method of evacuating the dropsical fluid, and it has been successfully employed: The spinal canal is opened by a transverse incision about two inches long, as near the body of the mother as possible; then a rubber sound with a firm mandarin is easily passed through the opening and up to the cranium; withdrawing the mandarin, the fluid readily flows through the catheter. If there should be hydrorachis also, of course the operation of Van Huevel is simplified. The suggestion of the operation was attributed by the elder Hubert to Lacoux. It was first performed by Tarnier in 1876; Charles states that he has frequently done it.

While violent traction has, as has been stated, unintentionally caused separation of the trunk from the head, some obstetricians have by choice employed detruncation. In a case in which this was done by Dubois sufficient fluid escaped to permit the ready delivery of the head. In Verrier's case (1873) the operator, after separating the body from the head, ruptured the anterior fontanelle with the hook on one of the branches of the forceps.

Encephalocele.—Hernia of the brain presents a round, soft tumor, the color of the skin covering it unchanged, caused by failure of ossification at the sutures and fontanelles. In hydrencephalocele there is a hernia of part of the brain, with a pouch containing serous fluid and communicating with one of the ventricles. According to Hergott, the first case of hydrencephalocele, also called hydro-meningocele, described was one by Ruysch in 1691. The adjoined illustration is of a case observed by Tarnier. Finding in the labor two heads, as he thought, he delivered by podalic version. Poole also delivered in a similar case by podalic version; the child was well developed, but had hare-lip and cleft palate upon the left side: it lived for two days. In the case reported by Deslandes the child presented by the pelvis, and, delay occurring in the delivery of the head through the inlet, the head was punctured and the obstacle to extraction removed.

Fig. 293.



Hydro-meningocele, a cause of dystocia (from Hergott).

The following illustration of podencephalus[1] is a variety of exencephalian monsters in which the hernia of the encephalon is made from an opening in the cranial vault normally existing, a fontanelle or suture, and not resulting from a failure of bony development, as in hyperencephalia; the hernia in this illustration occurred at the left fronto-parietal suture.

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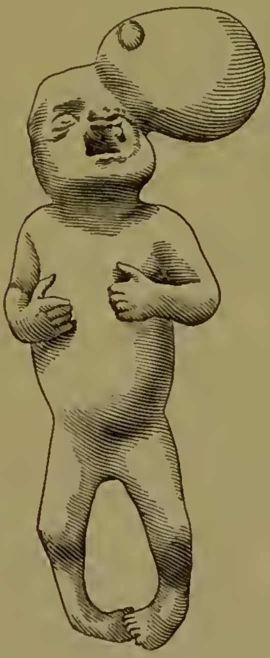
[1] The word is from πους, ποδος, foot, and ἐγκεφαλος, encephalon. The illustration is

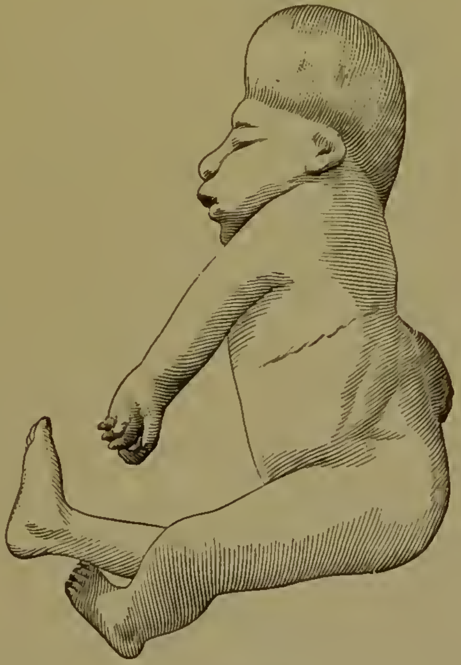
In *hyperencephalia*, according to Saint-Hilaire, the encephalon is situated in very great part outside of the cranial cavity and above the cranium, of which the superior part fails almost completely. "This is rarely the sole malformation presented by the fœtus; frequently there is a hare-lip, or ectromelia, etc. According to Geoffroy Saint-Hilaire, the fœtus is almost always of the male sex, born prematurely, and not viable." The presence of spina bifida and the distortion of the limbs will be observed in the illustration. The figure (taken also from a specimen in the Museum of the Philadelphia College of Physicians) represents a hyperencephalocele, the tumor appearing at the upper portion of the head. Charpentier regards presentation of the head as most favorable, but with the experience of Tarnier and Poole it would seem that delivery with the head last is best. But, whether head first or last, it may be necessary to diminish the tumor, as was done by Dr. Deslandes, in order that delivery can be possible. The illustration also shows the complication of the cranial tumor with

Fig. 294.



Podencephalia.

Fig. 295.



Hyperencephalus.

(Mütter Museum, College of Physicians, Philadelphia.)

from a specimen in the Museum of the Philadelphia College of Physicians. In some instances the polypoid form is much more distinct, the pedicle being small.

spina bifida, failure of ossification of the arches of the lumbar vertebræ being associated with similar deficiency on the part of some of the cranial bones.

Hernia through the base of the cranium is rarely met with. For example: in 93 cases of encephalic hernia collected by Houel there were only 9 of this variety. The seat of the hernial opening varies, but it is most frequently at the cribriform plate of the ethmoid bone, but it may occupy one of the sutures which unite the frontal and the nasal bones or to the superior maxillary. It is hardly possible that any of these herniæ can be so large as to interfere with labor, but they may, in case of cranial or facial presentation, render the diagnosis during labor difficult or impossible: the introduction of the entire hand into the pelvic cavity may be required to ascertain what part is presenting.

EXENCEPHALIA.—In this condition, the fœtus classified among monstrosities[1] by Geoffroy Saint-Hilaire, the upper portion of the cranial vault is almost entirely absent, and the greater part of the brain is external. Fig. 296 (Philadelphia College of Physicians' Museum) shows, associated with exencephalia, defective formation of the abdominal wall, to which reference will be made hereafter.

PSEUDENCEPHALIA.—In this there are only vestiges of nervous substance and the cranial vault is almost entirely absent.

In cases of exencephalocele difficulty in labor is rare, but that of diagnosis during labor may be great; and to remove this the introduction of the hand into the pelvis may be necessary. Should a fluid sac be associated with the exencephalia and by its size interfere with delivery, obviously puncture is indicated.

TUMORS OF THE NECK.—These may be fluid or semisolid, and in rare instances are so large as to cause dystocia. Monod[2] reported a case of difficult labor caused by a tumor of the neck as large as the fully-developed fœtal brain; it was pedunculated: the child was delivered living, and survived three days. Braxton Hicks[3] has recorded the case of a fœtus having a large cystic tumor of the neck, and puncture was necessary in order that birth could occur. Dr. Longaker of Philadelphia recently met with a case of difficult labor caused by a large myxoma of the neck: the above illustration shows the tumor and fœtus; of course the abnormal growth was much lessened in the delivery. I am also indebted to Dr. L. for the accompanying description: "The woman, who was seen by him in consultation with Dr. Santee, had a protracted first stage of labor. When the os was fully dilated the membranes were ruptured, and an excessive amount of amniotic fluid was discharged, so that the bed was saturated and a stream ran on the floor. The fœtus presented by the feet, and, the pains being inefficient, ergot was given. No difficulty occurred until the upper part of the trunk engaged. Very strong traction was unsuccessfully made, but the spinal column parted and the body was partially separated from the head. But this allowed some of the brain-like portion of the tumor to be discharged, thus diminishing its size and allowing it to engage with the head. After delivery the tumor was the size of an average fœtal head at term. Fœtus corresponded to the twenty-fifth to the twenty-sixth week."

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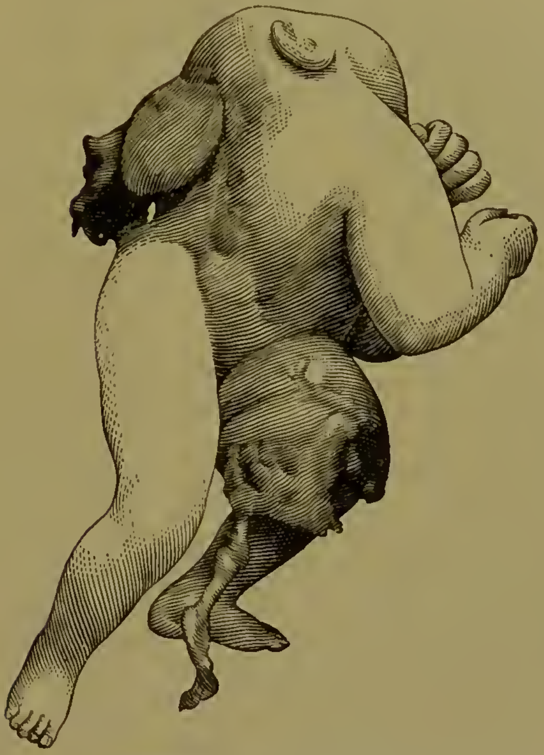
[1] It is difficult or impossible to give an acceptable definition of a single monster or monstrosity—a definition that will escape criticism. Littré has said that the word "monstrosity" is sometimes employed to signify any primary alteration whatever from the original specific type, from the simplest to the gravest—sometimes only the graver and more apparent anomalies, those which sensibly alter the form of organs and seem original, or at least are never due to an accidental cause. The word represents an ancient superstitious idea, and is derived from *monere*, to admonish, to warn, or to predict, and the birth of a monster was supposed to foretell evils or misfortunes: the monster was a divine omen. Festus defines *monster* as "quod moneat voluntatem deorum."

If we consider the first part of the definition given at the beginning of this note, a child born with hare-lip, a condition readily remedied by a surgical operation, as observed by another, would be called a monster, yet such an application does not correspond with the general meaning attached to the word.

[2] *Arch. Gen.*, 1829.

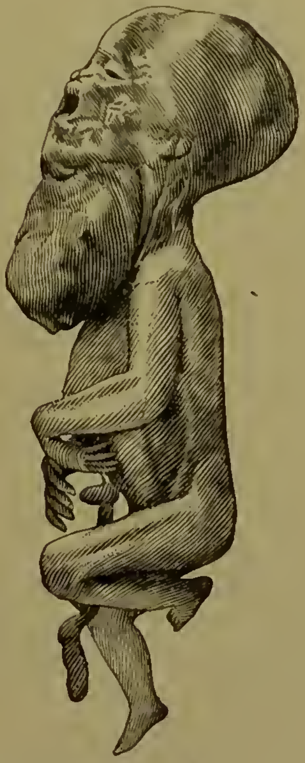
[3] *London Obstetrical Society's Transactions*, vol. v.

FIG. 296.



Exencephalia; also Omphalocele.

FIG. 297.



Myxoma of the Neck.

(Mütter Museum, College of Physicians, Philadelphia.)

Hayes[1] met with a difficult labor caused by a myxoma of the fœtus;

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[1] *Lond. Obstet. Soc. Trans.*, vol. xviii.

the tumor was near the shoulder, and extended from the sternum nearly to the vertebral column; it was necessary to puncture it before labor could end.

HYDROTHORAX.—No instance of hydrothorax by itself complicating labor has been recorded, but such complication has been observed in cases in which this affection was associated with similar accumulations in other serous cavities. Thus in a case reported by Galleti (1776) the obstetrician, having first separated the head from the trunk of a fœtus by traction with the forceps, could not deliver the body until the chest was punctured, and then the abdomen, a large amount of fluid being evacuated from each. In a case reported by v. Siebold there were dropsy of the chest, of the pericardium, and of the abdomen, and hydrocele: the delivery was very difficult, and effected by the forceps.

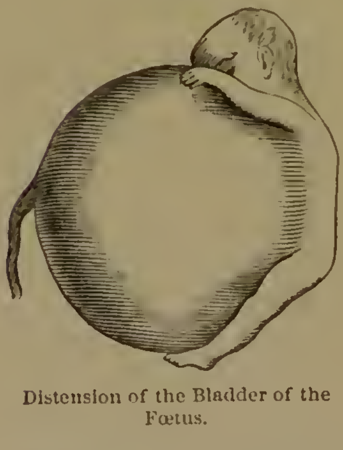
ASCITES AND ABDOMINAL TUMORS.—HYDRONEPHROSIS.—Ascites as a cause of difficult labor has been frequently observed. A case is reported by Robert in which, after having brought down the feet, the accoucheur found the labor arrested by ascitic swelling; the scrotum, too, was greatly distended, and upon its puncture not only the fluid it contained was evacuated, but also so much of that in the abdominal cavity that the child was readily born.

Hergott gives two instances in which an encysted tumor of the abdominal wall was an obstacle to delivery.

The bladder greatly distended with urine may, as in the subjoined illustration, be a cause of dystocia.

Fearn[1] has reported the case of a woman taken in labor when her pregnancy had lasted between seven and eight months, the head and umbilical cord presenting; after some time the head was delivered, and then the labor was arrested; the arms were removed, the chest opened, and then a large elastic tumor in the abdomen, pressing up the diaphragm, was discovered: the tumor was punctured, the puncture giving escape to a large amount of reddish, watery fluid, and the labor soon ended. Examination of this tumor showed that it was the bladder, but unconnected with the urethra.

FIG. 298.



Distension of the Bladder of the Fœtus.

Porak[2] has reported the case of a woman taken in labor at eight months, who after ineffectual attempts at delivery at home was brought to the Hospital Saint-Louis. The head and arms of the fœtus had been torn off in useless efforts to extract the child. Porak, recognizing that the dystocia was caused by distension of the fœtal abdomen, punctured it, and delivered. The cause of the distension was proved upon examination after delivery to be retention of urine, hydronephrosis, and cystic degeneration of the kidneys.

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[1] *London Lancet*, May 9, 1835.

[2] *La France Médicale.*

Madge[1] has given the history of a difficult labor, the breech presenting, and delivery of the body only effected by strong traction by means of a silk handkerchief passed over the buttocks and the thigh: the impediment was found to be a greatly distended condition of the child's abdomen, caused by the kidneys being so greatly enlarged that they resembled a bullock's kidneys in size, and also were like them in shape; each lobule "was converted into a serous sac, giving the appearance of, and constituting each kidney, a complete serous tumor." According to Hergott,[2] the first reported case of enlargement of the kidneys causing dystocia was that of Massna, regimental surgeon and practitioner of medicine, Copenhagen, 1828: the volume of the two kidneys was more than double that of the fœtal head.

Morris[3] states that congenital hydronephrosis may give rise to tedious and protracted labors, and even render delivery impossible until the abdomen of the child has been reduced by tapping. Braxton Hicks[4] has reported a case of labor made difficult by ascites associated with hydronephrosis. Ahlfeld[5] has given an example of dystocia caused by distension of the ureters.

In some instances of difficult labor caused by fluid enlargements in the abdomen, the child presenting by the feet, the difficulty has been removed by spontaneous rupture of the sac or organ.

Olshausen[6] has reported an example of great distension of the abdomen from an unusual cause impeding delivery: examination of the condition, after delivery, of the child, which was a female, showed that there was both urethral and anal atresia, and that the abdominal enlargement was caused by three tumors or pouches filled with liquid; the smallest was the bladder, and the next in size was the uterus, also filled with urine; and, finally, the third, larger than both the others, was the left colon. Comer Davies[7] has also given an instance of abdominal distension from an extraordinary cause: the child was a female, and its abdomen was chiefly occupied by a tumor which resulted from the impervious vagina being filled with fluid.

A third instance of abdominal distension from an unusual cause is given by Gervis.[8] The labor was difficult in consequence of the uterus of the child being greatly enlarged and containing about three-quarters of a pint of thin, flaky, serous fluid.

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[1] *Lond. Obstet. Soc. Trans.*, vol. xi.

[2] *Op. cit.*

[3] *Surgical Diseases of the Kidney.*

[4] *Lond. Obstet. Soc. Trans.*, vol. v.

[5] *Arch. f. Gyn.*, 1872.

[6] *Ibid.*, vol. ii.

[7] *Lond. Obstet. Soc. Trans.*, vol. xi.

[8] *Ibid.*, vol. v.

Enlarged liver has been the cause of dystocia, as in a case reported by Kilian[1] in 1854; in this case the forceps, and afterward the crotchet, were used in accomplishing delivery: the organ weighed two pounds and measured eight inches and three-quarters from side to side. Martin[2] has reported a similar case, in which the difficulty arose from enlargement of the pancreas, and Petit-Mangin[3] one in which the obstacle to delivery arose from hypertrophy of the spleen, ascites, and anasarca: the head presented, and after its extraction the chest was opened, and then an exit for the ascitic fluid was made by opening the diaphragm. In a case reported by Rogers[4] dystocia resulted from fibro-cystic disease of the undescended testicles.

Omphalocele—eventration, umbilical or abdominal hernia—is caused by an arrest of development, so that closure of the abdominal wall around the root of the cord does not take place, and some of the abdominal organs protrude, their covering being identical with the investment of the cord.

In the case of dystocia from this cause reported by Simpson[5] the fœtus presented the usual anomaly of attitude occurring in this form of arrest of development: anterior flexion of the body and members is replaced by a posterior flexion, the members being turned to the dorsal plane. It has been suggested that one cause of this abnormal attitude is that the weight of the abdominal viscera drags the dorsal spine forward. In the illustration (Fig. 296) of exomphalos associated with spina bifida this anomalous attitude is not present. If the intestines protrude very greatly, the obstetrician, feeling them projecting, it may be, from the os uteri, may for the moment think that rupture of the uterus has occurred, and that the mother's intestines have passed through the rent—an error that is readily corrected by partially drawing down the mass to the exterior. Delivery by podalic version is indicated if dystocia arises from exomphalos.

The tumor resulting from hydrorachis is rarely large enough to impede labor; if it is, puncture is plainly indicated. Porro,[6] however, has reported an instance in which the labor was delayed by hydrorachis associated with abdominal extrophy; the delay was ended by spontaneous rupture of the cyst. After the birth of the child the cyst was artificially filled, and found to contain 800 grams of fluid, and its maximum circumference was 37 centimeters.

In a difficult labor reported by Virchow[7] the head was delivered by forceps, and the body extracted as far as the lumbar region, when arrest occurred, which was found to be from a fluctuating tumor; this was opened by straight scissors and the delay was ended: the child lived fifteen hours.

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[1] See Hergott.

[2] *Monat. f. Geburt.*, vol. x.

[3] *Gaz. méd. de Paris.*

[4] *Am. Journ. Obstet.*, vol. ii.

[5] *Trans. Edinburgh Obstet. Soc.*, vol. vii.

[6] *Arch. de Gyn.*, t. iii.

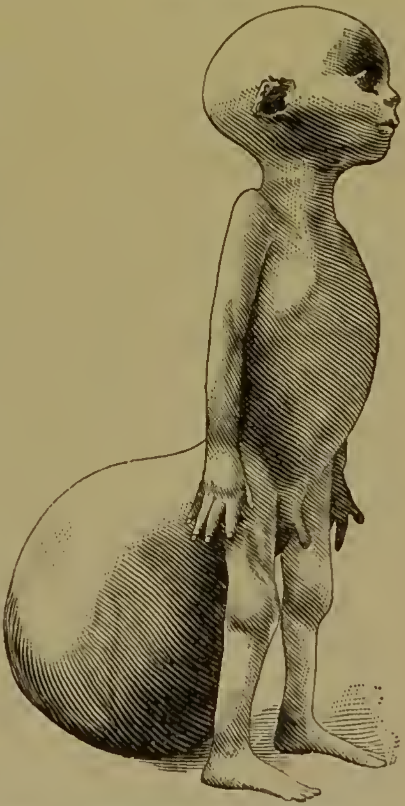
[7] *Gaz. méd.*, t. vi.

Mola[1] has collected 107 observations of tumors situated upon the lower portion of the trunk of the fœtus, and in only 18 were the labors thereby made difficult; 2 of the 18 were spontaneous, in 13 energetic traction was necessary to deliver, and in only 1 was the tumor punctured. These growths usually originate from the sacrum or the coccyx: in some instances they are so large that the child seems to be sitting on the tumor; in size they vary from that of a pullet's egg to that of a fœtal head at term, or they may be even still larger.

In a case under the obstetric care of Charpentier[2] the tumor became detached during podalic version and extraction of the fœtus, and, remaining in the uterine cavity, was mistaken for the membranes of a second child.

The adjoined illustration is from a specimen in the Museum of the Philadelphia College of Physicians, the case having been reported by Dr. Keller.[3] Dr. K. first saw the child three days after delivery; in the labor the presentation was cranial; no difficulty occurred except in the extraction of the hips, and this was effected by the blunt hook, fracture of the thigh resulting from its use. Dr. K. stated: "When I examined the child I found a tumor of the size of a man's head attached to the nates, exactly behind the anal orifice, and containing a liquid. On the eighth day a puncture of the sac was made, and more than a quart of a brownish liquid escaped, which became of bloody color as it continued to flow. The child died a few hours after from a hemorrhage into the cyst." The doctor then states that, a post-mortem being made the next day, the viscera were all found in a healthy state, and did not communicate with the tumor; the sac was shrivelled into folds and contained a large clot of blood; it was a perfect cyst, the parietes of which were very dense, covered in some

FIG. 299.



Sacral Tumor (Keller; Mütter Museum, College of Physicians).

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[1] *Strasburg Thesis*, 1868.

[2] Hergott.

[3] *Trans. Path. Soc. Philada.*, vol. i.

parts, particularly at its insertion in the nates, with soft conglomerations of blood-vessels.[1]

Dr. Keller also reported at the same time a case of delivery being arrested by a similar tumor, the child having been expelled as far as the breech; he punctured the tumor with a curved trocar, and after the evacuation of about a gallon of a brownish liquid the sac was emptied and the child naturally expelled: it lived for six hours, dying from capillary hemorrhage into the sac.

In very rare instances ankyloses of the fœtal joints have prevented accommodation of the fœtus in labor, and thus interfered with labor; further, such rigidity of the fœtus may be an assisting cause of eclampsia in labor, the uterine irritation during contraction being thereby greatly increased. The only instance of such complete fœtal ankylosis met with by the writer many years ago presented the complication of convulsions in labor, and the eclamptic attacks were coincident with uterine contractions. Rigor mortis in the fœtus has been known to retard the progress of labor by preventing the flexion, rotation, and extension of the head as well as the movements of the body that occur when the mechanism of labor is normal. Two interesting cases of this sort have been recently described.[2] In one case the descent of the head was retarded, probably from insufficient flexion; in the other the head was arrested at the parturient outlet, probably from a failure of extension; in both cases some difficulty was experienced in the extraction of the body. The rigidity disappeared respectively one and three hours after birth. The same complication might present itself in a living child that had been subject to idiopathic "contracture" in utero.[3]

General œdema of the fœtus usually has associated with it ascites, and the latter rather than the former may be the cause of difficult labor, as in the case of Bassett. An emphysematous condition of the fœtus, provided it be dead, and great distension of the abdomen, each consequent upon decomposition, may so increase the size of the child that delivery is difficult. McClintock,[4] referring to the rapidity with which such decomposition may occur after the access of air to the dead fœtus, stated: "I have seen the uterus become quite tympanitic from this cause after the accession of labor and before delivery." Puncture is plainly indicated if the size be so increased from this cause that delivery is hindered: some interesting cases of distension of the fœtus following death have been recorded. In one of Smellie's[5] cases (278) this able accoucheur, failing to turn, delivered with the crotchet; there was difficulty in extracting the body, which was finally accomplished by opening the abdomen with the instrument: "the difficulty proceeded from the belly's being greatly tumefied after death."

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[1] *Op. cit.*

[2] Davidson: "Dystocia from Rigor Mortis in the Fœtus." *Br. Med. Journ.*, Jan. 2, 1886; and Boxall: "Arrested Labor from Rigor Mortis of Fœtus," *Lancet*, ii., 1884, p. 60.

[3] Ribemont-Dessaigne, abstract *Nouv. Arch. d'Obstét.*, 1887.

[4] Note to Sydenham Society's edition of *Smellie's Works*, vol. i. p. 127.

[5] *Op. cit.*, vol. ii.

Chassaignac[1] was called to a primipara, forty-one years of age, who had been three days in labor. Repeated applications of the forceps finally extracted the head, at the price of fractures and separations of several bones, but the body remained undelivered. Depaul, arriving, ascertained that the abdomen of the mother was greatly distended by the formation of gas in the uterus from decomposition of the fœtus. He applied the cephalotribe to the chest, reducing the size of the fœtus by strong compression and traction, a large quantity of fetid gas escaping; the thorax was brought down, and finally the rest of the body and the limbs extracted: the mother died in six hours. The fœtus was very large, the abdomen and thorax greatly distended, and the members doubled in size by infiltration of gas in the connective tissue.

In Lize's[2] monograph, entitled "Researches as to the Different Obstacles which Retain the Fœtus after the Head alone, or followed by a part of the Trunk, has escaped from the Vulvar Orifice during Labor," he states that in only 10 of the 56 cases he has analyzed was the obstacle maternal, and in 46 fœtal: in 38 instances the child died, but in only 4 the mother.

The delivery of some varieties of single monsters has already been given, and in regard to the remaining ones but little need be said. The pseudocephalus—a monstrosity which, though apparently acephalous, has nevertheless the cranial vault hidden in the fleshy part which forms the upper region of the body, uniting in a single cephalothoracic mass all the organs above the umbilicus—may, according to Geoffroy Saint-Hilaire, cause difficulty in labor. If such difficulty occur, podalic version or the application of the cephalotribe may be indicated. It has happened that the acardiac monster is so greatly developed, as in a case of Mayer's referred to by Schroeder, that embryotomy is necessary. Different varieties of acardiac monsters have been described; for example, the amorphus, that is, without form: in this there is neither head nor members, but a somewhat irregularly shaped spheroidal or cylindrical mass covered by skin, in the interior fleshy, with rudimentary pieces of bone, and blood-vessels imperfectly developed, and possibly rudimentary intestines: in the only example of this monstrosity the writer has seen the entire mass was not greater than a large white potato, and presented somewhat the same uneven surface. It is hardly possible that an amorphus can give rise to difficult labor. Another variety is the acormus, a monster without trunk, or the latter is only rudimentary.

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[1] *Journal de Chirurgie de Malgaigne*, 1845. Other examples of difficult labor from this cause will be found in "Merriman" and in "Denman."

[2] *Ann. de Gyn.*, t. xiii.

Charpentier[1] states that the anencephalus—that is, a fœtus without a brain—is often of remarkable development; there is frequently polyhydramnios also. The presentation may be of the base of the cranium or of the face, but in some cases of one of the shoulders or of the feet. Cazeaux, referring to the diagnosis of single monstrosities, remarks: "Anencephalous cases, however, present certain peculiar indications which it is of interest to know. Whenever the finger touches the presenting part the fœtus is affected with convulsive and irregular movements which soon attract attention, the motions being probably due to direct irritation of the stump, which is generally surmounted by the hairy scalp in cases of this kind. By this sign I was enabled to diagnose an anencephalous fœtus before the membranes were ruptured, to the great astonishment of the students at the hospital of the clinic where the labor occurred."

Villeneuve has reported a case of difficult labor from anencephalia; the following is the report: He was called by a midwife to a woman thirty-five years of age, in her fifth labor, thirteen hours after it began. Upon his first digital examination he believed there was a face presentation, but it was impossible to learn the position. A subsequent examination showed that the head was being pressed posteriorly and below in the pelvic cavity, while a hard round body tended to engage behind the right pubic bone; and this body was thought at first to be a second head, but a more careful examination proved it to be the shoulder. He applied forceps, and the head was thus delivered, though a reapplication of the instrument became necessary; there was great difficulty in delivering the body.[2]

Podalic version is indicated in such cases.

In regard to tumors resulting from what has been termed fœtal inclusion, these tumors being superficial or occupying one of the cavities—the abdominal is the most frequent seat—there is nothing special to be added to the treatment which has been given for growths similar in size and consistence obstructing delivery.

DYSTOCIA OCCURRING IN CASE OF SEPARATE, AND IN THAT OF CONJOINED, TWINS.—Plural pregnancies[3] rarely give rise to difficult labor when the fœtuses are not united, thus making a double monster. Nevertheless, in some instances of separate twins more or less serious difficulties have arisen in consequence of one twin interfering with the delivery of the other, and hence these anomalies are to be considered.

Dystocia in Case of Separate Twins—Besson[4] states that the predisposing causes to such obstacle to birth are the great size of the pelvis, the small size of the fœtuses, and their occupying one sac. Interference with the natural course of labor, as by premature rupture of the bag of waters or the untimely administration of ergot, has been regarded as determining the accident.

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[1] *Traité pratique des Accouchements.*

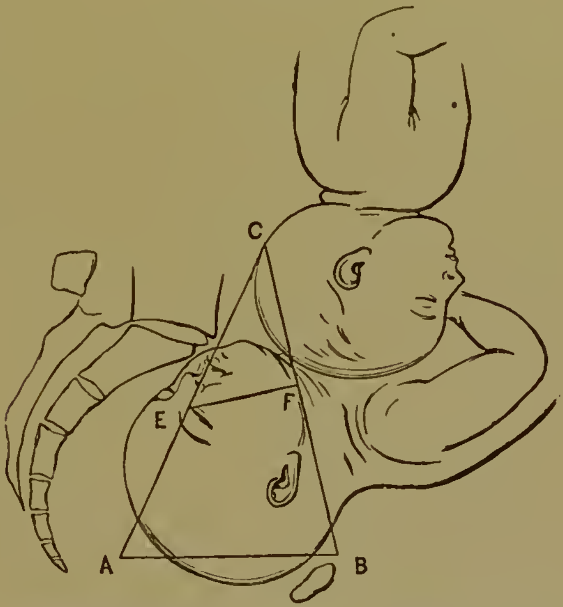
[2] Condensed from report in *Arch. méd. du Midi*, 1846.

[3] According to Braun, quoted by Zweifel, such difficulty occurs once in 90,000 labors.

[4] *Dystocie specielle dans les Accouchements multiples.*

No matter what the presentations, interlocking of the fœtuses may occur. In some instances—comparatively rare, however—the difficulty may be from both heads presenting simultaneously at the inlet: they cannot enter at the same time; one is in the way of the other. More frequently, as shown in the subjoined illustration from Barnes, one head descends into the pelvis, and the other, quickly following, is forced down, usually upon the neck of the other, and the further progress of each is arrested. The first head is delivered spontaneously or by the forceps, and then the arrest comes, or it may be before such delivery. In the illustration (Fig. 301), also taken from Barnes, the first child presenting by the pelvis and the second by the head, the former has been delivered, until arrest comes by the chin catching upon the chin of the latter.

FIG. 300.



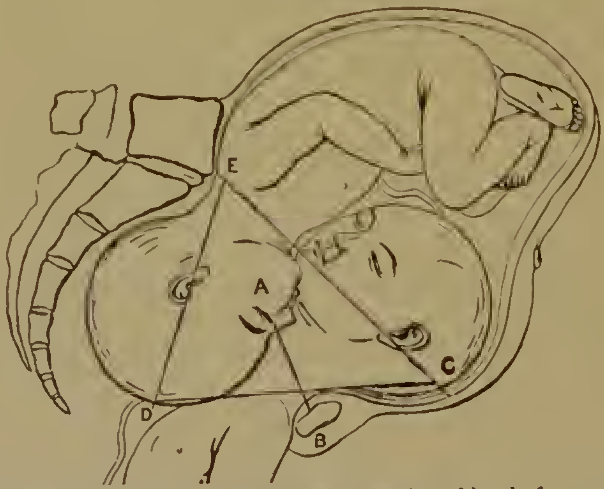
Shows Head-locking, both children presenting head first.

In some cases the head of the second child is fixed upon the thorax of the first. The locking of the heads may not be, as in the illustrations, by the chins, but by the occiputs or by a chin and occiput, or simply by the sides of the heads.

If both fœtuses present by the pelvis, difficulty may arise from the simultaneous descent of the lower limbs. In a case of such descent reported by Armand the midwife pulled so strongly upon the limbs that she brought away the bodies of the children, leaving the heads in the uterus. Schultze succeeded in delivering, in a case of labor with twins, four feet and one hand having descended, by drawing upon the two feet, which were the lower. Cazeaux quotes a case from Pleissman in which the latter, called to a woman in labor and finding that four feet had descended, thus causing locking of the pelves, succeeded in unlocking by having the woman's hips lifted up while her head was low: "The husband and brother-in-law of the woman passed their hands under her hams, and thus held her suspended, so that only the head and shoulders rested on the bolster. I intended, as soon as I mounted on the bed, to press back one or more of the free extremities into the womb, but two had already returned from the mere position of the mother, and the other three followed by the aid of my fingers. Immediately afterward I was enabled to introduce my hand into the uterus, and to withdraw successively therefrom three children by the feet."

The first child may present by the head, and the second be transverse, and locking occur. Thus Jacquemier[1] has narrated from the post-mortem examination the situation of the twins in a woman who died during labor: the head of the first fœtus was in the pelvic cavity, but its further descent had been stopped by the neck of the second child, which was below the shoulder of the first and formed a half ring. The first child may present by the pelvis, and the second be transverse, and difficulty occur, for the feet and the trunk may pass

Fig. 301.



Shows Head-locking, first child coming feet first; impaction of heads from wedging in brim; D, apex of wedge; E–C, base of wedge which cannot enter brim; A–B, line of decapitation to decompose wedge and enable head of second child to pass.

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[1] *Manuel des Accouchements*, t. ii. p. 131.

the obstructing body of the other, but the head be arrested. The last variety of obstruction given by Besson[1] is that in which the first child is transverse and the second presents by the pelvis. He quotes an illustrative case from Bartschler, in which two feet being found in the vagina, and delay occurring, exploration showed that the feet had descended, one on each side of the trunk of a second fœtus; that is, the first fœtus was *en cheval.*

The treatment of dystocia from interlocking of twins is—first endeavor by external and internal manipulations to unlock. We may imitate, if we fail while the woman is lying down, the plan of Pleissman, though not following his special method, but placing her in the genu-pectoral position; Galbraith succeeded in this way.

If we fail, some authorities advise forceps to the head of the second child (Fig. 301) or to that of the first (Fig. 300). In one instance strong traction upon the expelled limbs and body (Fig. 301) has drawn both heads through, but such an event is only possible if the heads are quite small and yielding. Considering now exclusively the latter condition of locking—that is, the body of one child expelled, the head of the other presenting—the application of forceps to the second head, made a rule by Reimann,[2] is condemned by both Barnes and Besson. The former wisely says that the first child, whose trunk is partly born, encounters by far the greater danger, and having discovered there is but a faint hope or no hope of saving it, attention should be turned to the best means of saving the second; the wedge may be decomposed by detaching the head of the first, or craniotomy be done. Besson advocates the same practice. Even Reimann admits decapitation of the first child if the application of the forceps to the head of the second is unsuccessful, and if the latter is living.

Now, in 34 cases collected by Besson where the first child presented by the pelvis, the second by the head, there were only 4 in which the former was born living. Such statistics prove more conclusively than any argument that consideration for its life is not an important element in determining the practice. Success, too, with forceps to the head of the second child can only be hoped for in conditions the same as those in which traction upon the body of the first child has accomplished delivery.

Dystocia from United Twins.—Veit in his elaborate paper[3] upon the management of labor in double monstrosities, in the beginning states that Hohl in 1850, from his collection[4] of cases scattered through the literature, arrived at the remarkable result that of 92 births of monstrosities belonging to congenital monstrosities *per defectum,* only 43 were delivered without obstetric aid; among these, only 4 with difficulty and 49 by operative interference. On the other hand, he found that in 129 cases of monstrosities *per excessum, coalitionem, et implantationem*, only 18 required obstetric aid.

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[1] *Op. cit.*

[2] *American Journal of Obstetrics,* 1877.

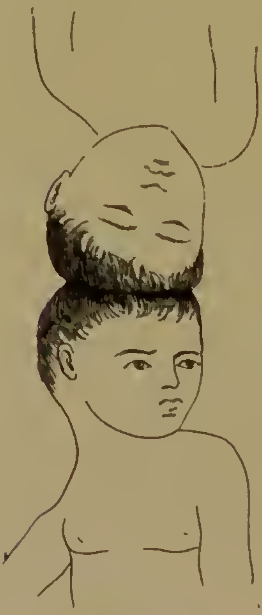
[3] *Die Geburten missgestalterer, kranker und todter Kinder,* Halle, 1850.

[4] *Ueber die Leitung der Geburt bei Doppelmissgeburten.*

Hohl's statement as to the facility of birth in the great majority of cases of double monsters is much stronger than that made upon the same subject by Playfair,[1] for the latter, out of 31 cases he collected, found only 12 were delivered naturally and apparently without trouble.[2]

Veit considers the means usually made necessary, if obstetric interference is required in the delivery of single monsters, as turning and extraction, only occasionally the blunt hook or the cephalotribe being required. He adds that in most cases it is necessary not to make a diagnosis during labor, and hence the interest of the obstetrician is chiefly directed to the delivery of monsters *per coalitionem*, these usually being what are known as double monsters. Monsters are four times more numerous in multiparæ than in primiparæ, but this is from the fact that there are four times as many of the former as of the latter.[3]

Fig. 302.



Metopagus.

From a practical point of view it seems best to consider the delivery of double monsters in an order founded upon the facility of delivery. Hence those which will be first presented are those which already are in the same line or can be so placed, thus offering a common longitudinal direction.

1. *Metopagus and Cephalopagus.*—In the first (see illustration) the fœtuses are united by the cephalic extremity, forehead to forehead and vertex to vertex: the name is derived from *μετωπον*, the anterior and superior region of the head, and *πήγνῦμὶ* to unite, to make firm or whole.

In the cephalopagus (from *κεφαλή*, the head, with the same Greek verb just given) the bodies of the fœtuses are turned so that the faces are in opposite directions, and the union is not only between the vertex, but also the forehead of one child is united with the occiput of the other. In neither of these varieties of the craniopagus will difficulty in labor usually occur, for, though the bulk may be greatly increased, the component parts of the monster are not placed side to side or back to back, but end to end; that is, may be brought or already are in a straight line. But in some instances of craniopagi the union of the head is at the occiput or at the foreheads, and the bodies are obliquely inclined to each other; the delivery, according to Veit, has not created any great difficulty. In support of this statement he refers to three cases in which the union was at the foreheads, in two of which the children, in both instances girls, were born alive, and in one they lived until ten years old.

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[1] *Transactions of the London Obstetrical Society*, vol. viii.

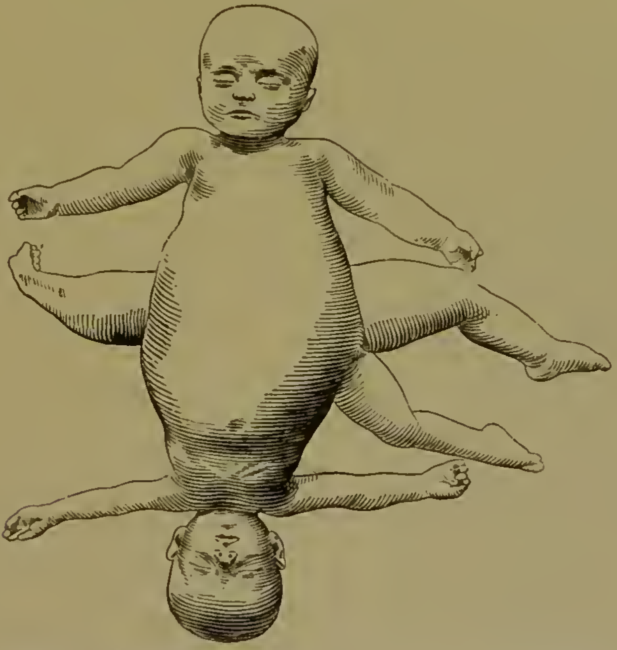
[2] Playfair, apparently forgetting the more favorable statement of Hohl and derived from larger statistics, says "no less than 12," as if this were especially encouraging.

[3] Veit.

In a case of craniopagus reported by Vottem, referred to by Playfair as well as by Veit, a shoulder presented, and podalic version was performed and delivery readily made. But Veit states that, according to Förster's report, the only part of the second fœtus developed was the head: in Saint-Hilaire's classification, however, this variety of monstrosity is called epicoma, from ἐπι, upon, and κόμη, the hair.

2. *Ischiopagus.*—The ischiopagi are characterized, according to Geoffroy Saint-Hilaire, by the pelvic reunion of two individuals with a common umbilicus, placed end to end and in a similar position; that is, with the faces on the same side. An ischiopagus,[1] then, is a double

Fig. 303.



Ischiopagus (Mütter Museum, College of Physicians, Philadelphia).

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[1] In a brief poem by one of the greatest and best of American poets, Whittier, the author has perpetuated the legend of the "double-headed snake of Newbury." But this snake was not a dicephalus, as the poet has called it, for, according to his description, it corresponded to the ischiopagus in the human race, if such a form of reptilian monstrosity is possible.

being, terminated at each of its extremities by a thorax, two thoracic members, a neck, a head, and presenting in the middle portion a double abdomen, double abdominal members, and, quite at the centre, a common umbilicus. In the illustration presented herewith, copied from a cast in the Philadelphia College of Physicians, it will be seen that the lower limbs upon one side are fused together, making what is known in the separate fœtus a deformity characteristic of the symelia.

In Prunay's case of ischiopagus the twins, female, had club feet; they lived for several months. The chief point in the conduct of the labor is to prevent the four lower limbs being born together, but let each pair be born with the pelvis to which they belong.

Dipygus (δις, double, πῦγή, rump or buttocks—duplication of the posterior pelvic region of the body).—By the word polymelia, πολῦς, many, and μελος, member, is meant a monster characterized by one properly-developed fœtus, and a second one having its development limited to one or more members, which are inserted in the former.[1] In the pygomelia, one of the varieties of the class, the supplementary members are inserted between or behind the normal lower members. Pygomelia may therefore be taken as synonymous with dipygus.

Labor presents no difficulty unless in the delivery of the pelvis; in some instances the development of the supernumerary member or members is so slight that no serious obstacle results, and in most cases the fœtal pelvis is not so greatly developed that difficulty comes. If the pelvis presents, all the lower limbs should be brought down, and the same rule holds after version made in consequence of a transverse presentation. The dipygus or pygomelian monster is to be classed with the craniopagus and the ischiopagus, so far as delivery is concerned, in this regard, that the component parts of the monstrosity can be brought in the same line. In the only pygopagus I have seen, a negro child some two or three years old, there were two supernumerary lower limbs, but they were quite small even then, and could not have caused any difficulty in the labor.

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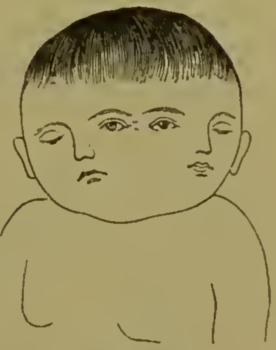
[1] Montaigne in one of his *Essays* (Hazlitt's translation, vol. ii. p. 510) describes a human monster which was fourteen months old when he saw it: after speaking in general of the child, he says: "Under the breast it was joined to another child, but without a head, and which had the spine of the back without motion, the rest entire; for, though it had one arm shorter than the other, it had been broken by accident at their birth; they were joined breast to breast and as if a lesser child sought to throw its arms about the neck of the one something bigger. The juncture and thickness of the place where they were conjoined was not above four fingers or thereabouts, so that if you thrust up the imperfect child you might see the navel of the other below it, and the joining was between the paps and the navel. The navel of the imperfect child could not be seen, but all the rest of the belly, so that all that was not joined of the imperfect one, as arms, buttocks, thighs, and legs, hung dangling upon the other, and might reach to the mid-leg." The description shows plainly that this monster was a heteradelphus, the least rare of the heterotypic variety of monsters in the human species. It is quite probable, too, that the presentation was pelvic, for only upon this hypothesis can a fracture of one of the arms at birth be best explained: ascension of this arm occurred, and in bringing it down it was broken.

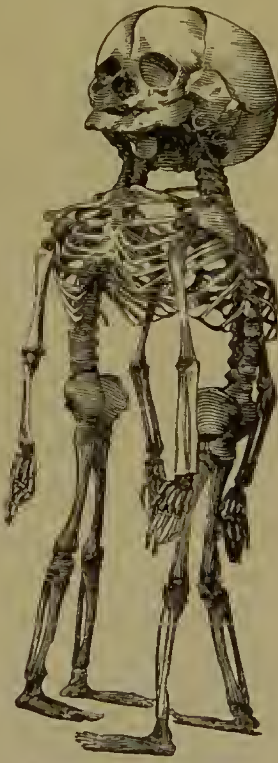
Fig. 304.



Diprosopus.

Diprosopus (from *δις*, double, and *προσωπον*, the face).—Examples of diprosopus, or a monster with a double face, are not frequent, Förster in 500 double monstrosities finding only 29 of this variety. The appended illustration shows one of the forms of this anomaly. Veit cautions against the danger of confounding a diprosopus, in case the head presents, with a hydrocephalic head; there is a larger number of sutures in the former, and in the latter the sutures are wider, the bones more flexible and thinner, and the rounding of their angles is more apparent. In this anomaly there is the same danger of rupture of the uterus as in the disease mentioned. Podalic version is not indicated, nor is the application of the forceps; but if the conjoined heads present great bulk, perforation and the cephalotribe may be required.

Fig. 305.



Deradelphus[2] (Mütter Museum, College of Physicians, Philada.).

Monocephalus.—In this monster a single head, without any exterior trace of duplicity, surmounts two bodies more or less intimately confounded and for a greater or less extent (Geoffroy Saint-Hilaire). If the trunks are united above and separate below the umbilicus, it receives the name of deradelphus and thoradelphus. The appended illustration of a deradelphic monocephalus is from a specimen placed in the museum of the College of Physicians by Dr. Warrington.[1] The woman who gave birth was a multipara, and was taken in labor about the time of the supposed end of her pregnancy, and Dr. Warrington's pupil, Dr. J. Pembroke Thorn, of Stevensburg, Va., was sent for to attend her. Dr. T. shortly after his arrival found four feet presenting in the vagina, and, thinking they belonged to separate twins, endeavored to push up two of them; in this effort he failed, and so did Dr. Warrington, who was called by Dr. T. when this difficulty was manifested. Then traction was made upon all four of the lower limbs, and delivery was made.

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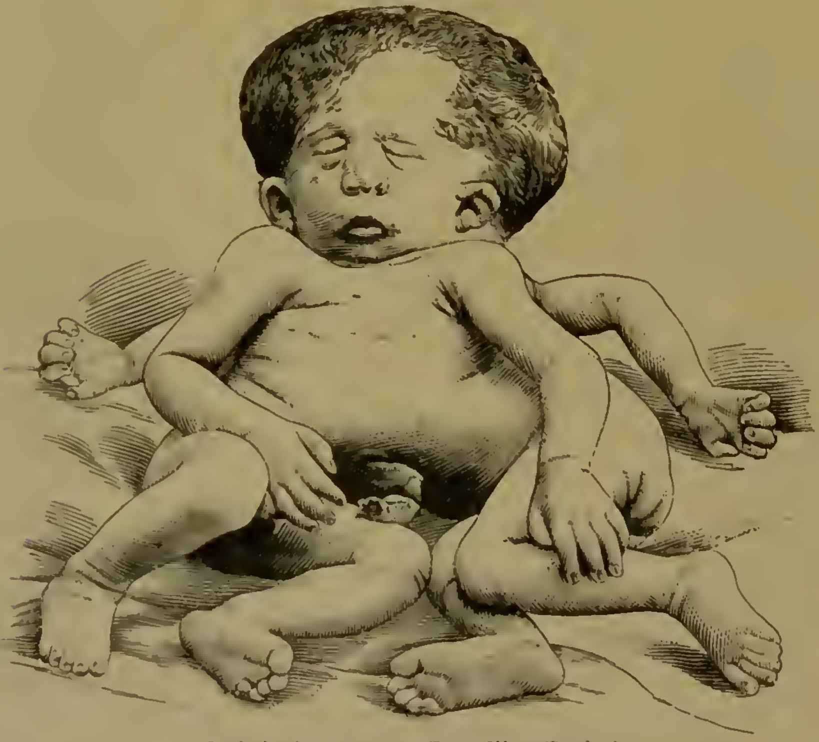
[1] *Summary of the Transactions of the College of Physicians*, vol. i., New Series.

[2] The name is from *δερή*, neck, and *ἀδελφος*, brother.

Cephalo-thoracopagus.—Figs. 306 and 307[1] are front and side views of a monstrosity occurring in the practice of Dr. J. B. Sterley—now of Reading, Pa., then living in St. Mary's, Elk county—February 23, 1878. The mother was a German, eighteen years of age, and had borne a child before this pregnancy; the labor, which was thought a month premature, was protracted, the child living when it began, but dying during its course. The head presented and the delivery was spontaneous: the child weighed six pounds ten ounces. It was a "double female infant, united by head, neck, and thorax. Thoraces united by anterior surfaces. Union of head and neck in a manner to show a complete face with ears on one side; on the other two ears in juxtaposition, above which is a rudimentary eye. Limbs four in number, and normal."[2]

FIG. 306.



Cephalo-thoracopagus, Front View (Sterley).

Upon looking at the front view one might justly conclude that the monstrosity was a deradelphus, but the additional ears and eye observed in the side view negative this, for in the deradelphus there is a single head without supernumerary parts; and therefore it is correctly designated as a cephalo-thoracopagus.

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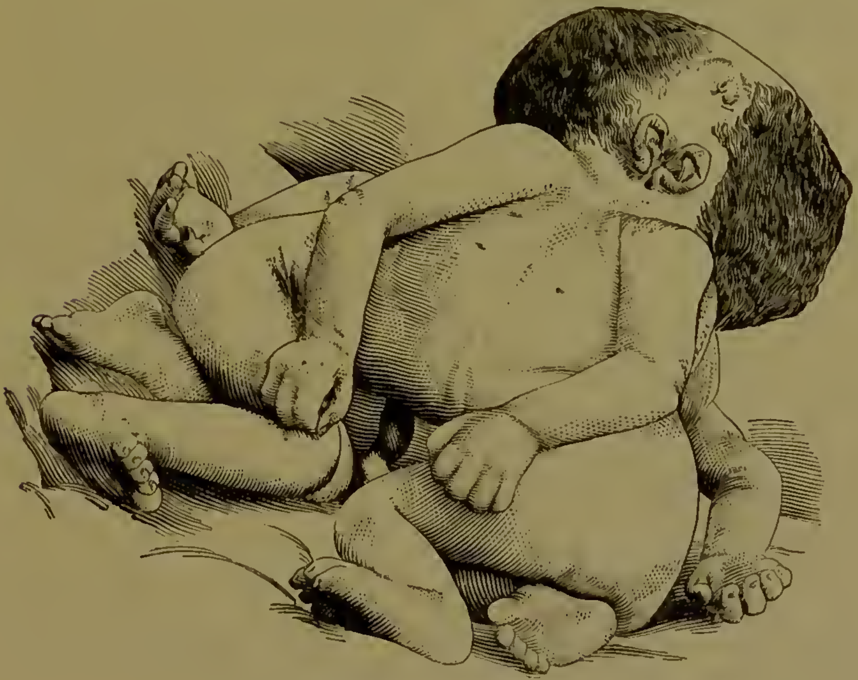
[1] I am indebted to Dr. C. R. Earley for the photographs from which these illustrations are taken, and to Dr. Sterley for kindly communicating some of the facts in regard to the labor, etc. not mentioned in connection with the specimen as recorded in the Catalogue of the Army Medical Museum, to which Dr. Sterley presented it.

[2] From description in Museum Catalogue.

The history of the labors in these last two cases shows that spontaneous delivery may occur either when the head presents or when the feet come first, for the traction used in the first, the case of deradelphus, was not probably more than a slight assistance to Nature's efforts; in other words, it is not essential to actively interfere, at least early in the labor, and, further, a resort to podalic version in case of cranial presentation in either variety is not positively indicated.

Fig. 307.



Cephalo-thoracopagus, Side View (Sterley).

Derodymus.—This term, derived from δερη, neck, and διδυμος, twin, is applied to a monster having two heads, two necks, a single body, and usually two lower and two upper limbs, though in some instances there may be additional members more or less rudimentary in development. One of the first-reported cases of derodymus is given by Peu.[1] In his history of the labor, which occurred on the 29th day of August, 1674, he states that two midwives had tortured the poor mother for hours endeavoring to extract the head of an infant which had half escaped from the internal mouth of the womb. Upon making an examination he found a second head, that the two heads were upon separate necks, and that there was only a single body. He performed version, brought down the body as far as the axillæ, then liberated the arms, after which he delivered first one and then the other head without rupturing anything. He adds, with charming frankness, if not with commendable modesty, "and this was the end of an operation equally beautiful and difficult that rescued the poor mother from shipwreck."

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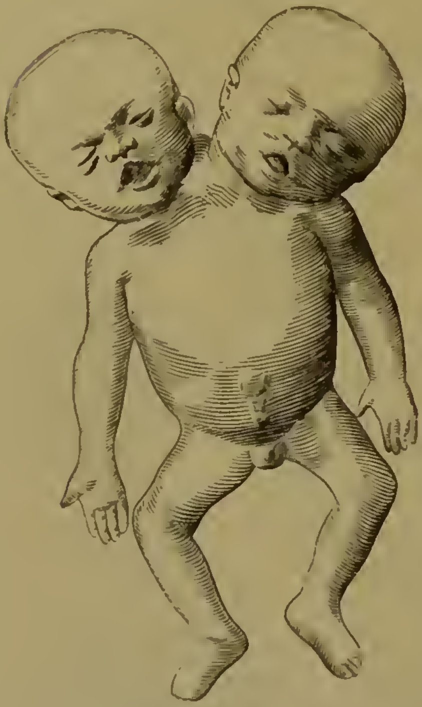
[1] *Op. cit.*

Fig. 308.



Derodymus (Mütter Museum, College of Physicians, Philadelphia).

Boerstler's case occurred in a woman in her ninth labor, and when called he found a pelvic presentation; further examination showed that there was a third lower limb firmly united to the body of the child and arising from the dorsum of the ilium; the delivery of the body and of the heads was accomplished without great difficulty; that of the latter could not have been effected but for the good fortune of the smaller head resting upon the neck and cheek, up to the malar bone, of the larger one. The monster[1] survived five weeks, during which time nursing[2] might be taking place on the part of one while the other was crying or sleeping. The third lower limb really consisted of two united limbs; that is, there was this resemblance to the symelian. In Pfeiffer's[3] case, credited by Playfair in his statistical table to Dr. Meigs, delivery of one of the heads occurred first, then of the body, and last of the second head.

Moore[4] reports a case of dicephalus monster causing dystocia. A head descending, he applied forceps, but failed to deliver. Then, recognizing that the difficulty came from a second head, he turned, and delivered. Fœtus nineteen and a half inches long and weighed eight and three-quarter pounds.

King[5] has recently reported a case of dicephalus, the woman having been in labor two days; the labor was premature, the woman a primipara. One of the heads presented, but attempts to deliver it with

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[1] The specimen is in the Museum of Jefferson Medical College. The case is reported by Dr. Boerstler in the *American Journal of the Medical Sciences*, vol. xxx., 1855.

[2] In the case reported by Facello, a tricephalus born alive and living for three days, the child sucked with all three mouths, and cried also with all three. (See Veit, *op. cit.*)

[3] *Meigs' Obstetrics*, 3d ed., p. 425.

[4] *Lancet*, June, 1882.

[5] "An Unusual Case of Monstrosity," by James K. King, Clifton Springs, New York, *Edinburgh Obstetrical Society's Transactions*, vol. xii.

Simpson's axis-traction forceps having failed, the presenting head was removed and delivery effected by podalic version and extraction. The monstrosity was nineteen inches long and weighed twelve pounds: the mother died three hours after delivery.

Two cases of dicephalous monsters are reported by both Playfair and Veit, in which decapitation was done, and then turning. The following observations by Veit are of interest in this connection: "If after decapitation podalic version appears a too dangerous operation for the mother, we will find that delivery by means of evisceration or of simple traction on the body is to a great extent rendered easy, as we have made room for hand and instruments. The repulsive impression made upon those present by decapitation is plain from the fact that Kleinwächter desires to more restrict the limit; but in a case of dicephalus dibrachius this operation removes a great obstacle, and the less the skill of the obstetrician the more necessary is decapitation before making an attempt at version. The case corresponds as to indications with those of absolute and relative contraction of the pelvis. The positive indication for Cæsarean section is, with reference to the obstetrician, a personal one. Whoever has the skill of Michaelis may still perform embryotomy with a conjngate of one and a half inches, while he who is less expert will do better for the mother if he selects Cæsarean section, even though the conjugate be two inches and a half."

In Hesse's case two applications of the forceps were made successively to the heads.

Veit remarks that in shoulder presentation the mother is quite as often saved by embryotomy as by version, and advises if the neck can be reached to perform decapitation, and if, as in most cases, the trunk is more accessible than the neck, eviscerate the thoracic and abdominal cavities, and extract with the hand, or according to Robert Lee, with the blunt hook.

It is evident from the narratives of cases that have been given that the delivery of a dicephalus may occur spontaneously whether one of the heads or the breech comes first; that traction with the forceps in the one case or with the hand in the other may be necessary; and, finally, that a spontaneous or artificial—that is, without mutilation—delivery may occur, unless the monstrosity be of great size or if there be an irreducible transverse presentation; and in either of the latter conditions embryotomy is required. The reduction of the size of the dicephalus required may be, as in King's case, by decapitation of the first head or by opening of the thoracic and abdominal cavities. Further, it seems to be well established that in case the heads come last their delivery is best effected by carrying the trunk well up over the mother's abdomen, "so as to cause the posterior head to pass first into the cavity of the pelvis," as Playfair directs.

Xiphopagus.—The Siamese Twins presented the best-known example of this variety of monstrosity. In regard to the delivery of these twins, one was born with the head, the other with the pelvis, presenting. Veit states that it is possible to develop the first child in a xiphopagus, the pelvis presenting, completely before the other child leaves the uterus, as was proved in a case taken by Kleinwächter from Jungmann's paper. Nevertheless, Schönfield[1] found it necessary in a case where one head presented, the other being at the ilium, to separate the children; the first child was then delivered with the forceps, and the second, which was transverse, by podalic version. But Schönfield's patient was a primipara, and the combined weight of the children was seventeen and a half pounds.

Thoracopagus.—Playfair,[2] who in his paper made four classes of monsters, included in the first "two nearly separate bodies united together in front to a varying extent by the thorax or abdomen." From a study of nineteen cases belonging to this class he formulated the following conclusion: "The most favorable presentation is undoubtedly that of the lower extremities, and if the head present and the nature of the monstrosity can be recognized, turning should be resorted to and the feet of both children brought down into the pelvis." Nevertheless, embryotomy may be necessary though the feet present. In a case[3] reported from Switzerland separation of the delivered trunk—at least delivered as far as the shoulder—from the head was necessary before the second child could be born. In Huron's[4] case the monster was delivered as far as the thorax, when embryotomy had to be done upon the first child. While, therefore, Playfair's rule may be accepted as wise practice, it ought also to be remembered that it gives no promise of certain success.

Pygopagus (from πύγή, buttocks, and πηγνὺμι, to unite).—This is a monster which, according to Saint-Hilaire, is composed of two individuals, each with an umbilicus, united in the region of the buttocks. Veit gives the following definition: Two complete individuals which only by the sacrum and by the coccyx, or only by the latter and adjacent soft parts, are connected. The most famous example of a pygopagus was that of the Hungarian Sisters, Judith and Helen, who lived to be twenty-three years old. At the birth of the Hungarian Sisters, Helen preceded with presentation of the head, and was delivered as far as the umbilicus; after three hours the lower portion of the body followed, and then Judith was born, her feet coming first. The pygopagus described by Normand was born in a similar manner. In the pygopagus of Jungmann, published by Kleinwächter, labor lasted twenty-one hours before the membranes ruptured, and again for eleven hours before the pains became strong; one hour later, after the midwife replaced a prolapsed arm, the head and arms were born, but the labor stopped when the body had passed out as far as the umbilicus. The midwife finally brought down the feet of the other child, and the delivery was soon completed. In Hochstetter's[1] case the labor occurred six weeks before the time. He found three feet presenting, and, failing to return one of these, he brought down the fourth foot, and succeeded in bringing out the monstrosity as far as the thorax. The arms were directed upward, and with great difficulty they were brought down, and then the extraction was completed.

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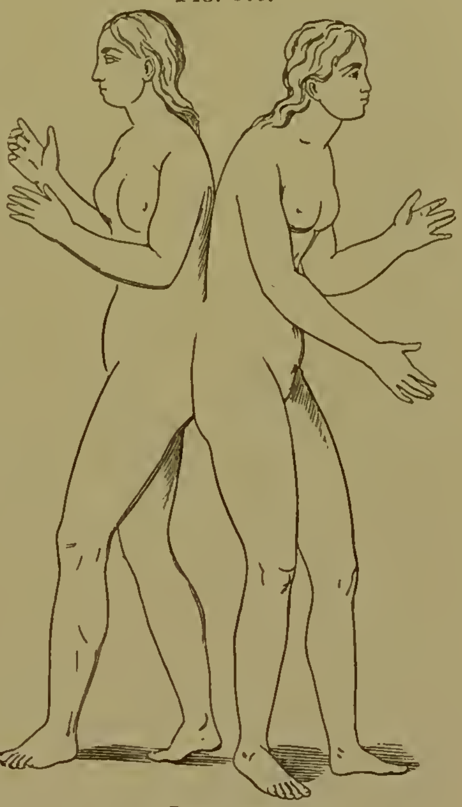
[1] See Veit's paper.
[2] *Op. cit.*
[3] Veit: *op. cit.*
[4] *Ibid.*

In the management of labor in case of a pygopagus the obstetrician is without choice as to presentation, for version is probably impossible, and he must accept the presentation offered. The history of the first three cases would indicate that a presentation of the head of one of the twins was not unfavorable; and, indeed, when we see that in the fourth case, the feet presenting, the delivery of the twins must be simultaneous, it is evident that the pelvis and the entire birth-canal can only permit this passage if the twins are very small. Certainly, Playfair's law of podalic version is not indicated in the delivery of this variety of double monsters.

Fig. 309.



Pygopagus.

It is not necessary to refer to other monstrosities in their connection with dystocia. The fact that spontaneous delivery occurs in so many cases, one reason for which is that the labor is often premature, teaches the obstetrician not to be in haste to intervene; and the difficulty in many instances of knowing before delivery the kind of monstrosity will make him then cautious in the mode of intervention. Further, the Cæsarean operation is neither indicated nor justifiable in the delivery of a monstrosity.

DYSTOCIA FROM ANOMALIES OF THE FŒTAL APPENDAGES.—Adhesions of the fœtus to the placenta or to the membranes have in rare instances caused difficulty in labor, requiring in some artificial breaking of the adhesions, and in others the fœtus and its appendages have been expelled together. Malformation of the child, possibly to such a degree that it becomes monstrous, is frequently observed in these cases. Charvet[1] has described a cebocephalus in which there was adherence of the placenta to the cranium and the face.

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[1] Veit: *op. cit.*

Unusual thinness of the membranes permits their early rupture, and thus premature escape of the amniotic liquor, and from this delay in the dilatation of the os uteri results. If the membranes are preternaturally thick, the membranes may remain entire after the bag of waters has fulfilled its purpose in labor. Generally, the rupture of the sac is readily effected by pressing against its most prominent portion with the end of the finger during a uterine contraction; if this should not succeed, similar pressure may be made with a uterine sound or probe, or the notched nail of the index finger employed in making a to-and-fro movement against the membranes, the nail being thus used as a saw.

The placenta may prolapse, even when it has occupied its normal site, in consequence of premature detachment, whether from trauma or other cause. The chief consequence of such detachment is grave hemorrhage, and therefore the treatment of this prolapse will be considered under another head. Abnormal adhesion of the placenta to the uterus may be the consequence of placentitis, possibly having its origin in an endometritis present when pregnancy began; this condition is not frequent, and rarely involves the entire uterine surface of the placenta; if the latter be the case, a partial detachment of the placenta occurs, and hemorrhage is the necessary consequence: hence its treatment will be considered elsewhere. Decidual endometritis at other points of the endometrium than that which is the placental site may result in adhesions of the membranes to the uterine wall; the same inflammatory process that causes preternatural adherence of the decidua to the uterine wall causes adhesion between the decidua and the chorion. Pain resulting from this inflammation during pregnancy does not enable us to recognize the presence of decidual endometritis, and this recognition can only be made during the expulsion of the placenta. The placenta may spontaneously or as the consequence of uterine expression enter the vagina, or even emerge from it, but upon attempting to remove it it is found retained by attached membranes. In other instances the placenta is kept in position, though detached, by adhesions of adjacent membranes to the uterine wall. Finally, adherences may exist on the part of the placenta as well as of the membranes. In the first of these conditions, as described by Kormann, probably in the majority of cases sufficient time has not been given for normal retraction of the uterus, by which detachment of the membranes is effected, to occur, but too great haste, either by expression or by traction upon the cord, has been made to deliver the placenta. The method commonly used, should the placenta descend into the vagina, the membranes remaining in the uterus, is to detach them by turning the placenta around two or three times, thus twisting the membranes into a rope, and then withdrawing them. But if detachment cannot be thus effected, the introduction of the hand into the uterus is necessary, and then the fingers are used directly to detach and separate the adhesions. However, manual detachment of the membranes is usually rendered necessary only in those cases in which similar separation of the placenta is required; and as that must be considered in connection with post-partum hemorrhage, nothing more in reference to the former will be said now.

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[1] *Cebocephalie*, by Dr. A. Charvet, Grenoble, 1874. The family of cyclocephalians comprises five varieties—viz., ethmocephalus, cebocephalus, rhinocephalus, cyclocephalus, and stomocephalus. There is in the Museum of Jefferson Medical College a perfect specimen of rhinocephalus which I hope to describe at an early day.

Excess of the amniotic fluid, producing great distension of the uterus, as a cause of delay in labor, has previously been considered.

Anomalies relating to the umbilical cord are the most frequent in the class of anomalies of the fœtal appendages causing dystocia. While the umbilical cord usually measures from eighteen to twenty inches, Napier[1] states that it may be from two to seventy inches long; Dr. Matthews Duncan,[2] however, asserts that we have not reliable accounts of very short cords; and Crosse discredits Davis' report of a cord two inches in length.

According to Baudelocque, the length varies from 20 to 22 inches; Tarnier gives the variation as from 17.7 to 22.8.

Tyler Smith exhibited to the Westminster Medical Society a cord which measured 59½ inches; Negebauer saw one which measured 67¾ inches; and Cazeaux cites from Schneider one 3 meters in length.

Chantreuil,[3] in referring to the brevity of the cord, makes the following statement: "The shortest cord which Devilliers has seen was 11 inches; Reil and Meissner have each seen a cord of 5 inches. Of 12,303 cords measured in the clinic of Prague, the shortest was 4 inches. Malgouyré has seen one 2½ inches."[4]

Duncan mentions in the same paper from which we have quoted instances in which the cord was six, seven, and ten inches as examples of absolute shortness.

So far as increased length of the cord is concerned, such increase predisposes to prolapse of the cord and to the formation of circumvolutions around the child or its members, in some instances these coils making the cord relatively shorter, while absolutely it is longer than normal; and thus if either condition be present dystocia may result, for this has happened either in relative or absolute shortening of the cord; the difficulty is increased by the cord passing between the thighs of the fœtus in a pelvic presentation, as in the case reported by Bell,[1] in which the cord measured twelve inches, the child straddling it or being *à cheval* with reference to it. Depaul in a similar case, the cord being between the thighs and very tense, divided the cord; delivery soon followed, the pains being aided by traction.

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[1] *Transactions of the Edinburgh Obstetrical Society*, vol. viii.

[2] *London Obstetrical Society's Transactions*, vol. xxiii.

[3] *Des Dispositions du Cordon qui peuvent troubler la marche régulière de la Grossesse et de la Accouchement*, Paris, 1875.

[4] Chantreuil: *op. cit.*

Disturbance in the first stage of labor from shortness of the cord, whether absolute or relative, even though it measure but a few inches, is hardly probable, for, as pointed out by Duncan, advance of the uterine insertion occurs with the advance of the fœtal attachment; "during all the progress of the fœtus through the genital canal the uterine insertion of the cord is also progressing." So too, and for like reason, prior to the birth of the head difficulty cannot arise unless the cord be very short. Nevertheless, certain signs observed in the second stage of labor have been regarded as furnishing more or less clear indications of shortness of the cord. The labor is protracted without other obvious cause; a depression in the uterus is felt near or at the fundus—corresponding, as is supposed, with the placental site—occurring during a uterine contraction, and the woman experiences severe pain at this point; and the presenting head, for example, quickly recedes with the end of a uterine contraction, such contraction usually being briefer in duration than normal, and suddenly ceasing. Napier regards uterine inertia as a most important symptom of abbreviation of the cord: in his paper, however, he only refers to this diminution as resulting from coils about the neck of the fœtus.

Roederer, Leroux, and Levret have spoken of hemorrhage following such uterine contraction, this being caused by detachment of the placenta: as one of the signs, Winckel has mentioned elevation of temperature.

Some observers have called attention to the failure of anterior rotation of the occiput in cases of brevity of the cord arising from circulars, but posterior rotation was observed; and Chantreuil attributes this deviation from the ordinary mechanism of labor to the fact that such rotation may have for its effect tightening the spiral about the child. But if the neck be encircled several times by the cord, an interference with flexion would result, and hence the ordinary rotation fails. Nevertheless, neither hypothesis explains the fact that posterior rotation frequently occurs not only where there is relative, but also in absolute, shortness of the cord. If the shortening be from such coils around the child's neck, and if after the head is born artificial means are not taken to relieve the tension of the cord, semi-revolution of the child around the cord as a centre—it is called evolution by Duncan, who probably first described it—takes place, so that the anterior surface is brought to look forward, and thus the tension is lessened by the removal of half of one of the circulars (coils) about the neck. Among the consequences of great shortness, absolute or relative, of the cord, are its rupture, premature detachment of the placenta, and uterine inversion.[1] Dryenfurth[2] has reported a case in which the cord was only about two inches long, and inversion of the uterus was the consequence. Rupture of the cord generally occurs about the middle portion, according to Chantreuil, but it may be torn at either extremity. In a case reported by Devilliers, instead of the cord rupturing it was entire; but a small portion of the placenta was torn away. The strength of the umbilical cord varies, but its ultimate tenacity, as established by the experiments of Duncan and Turnbull, "was on an average eight and a quarter pounds, the weakest cord requiring five and a half pounds, and the strongest fifteen pounds, to tear it across or to break it." If the lessened length be the result of circulars about the child's neck, it is possible it may perish from asphyxia.

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[1] *Memorabil.*, 1882.

Negrier and Pfannkuch have shown that if the cord be varicose it ruptures more readily than in the absence of this condition. 5250 grams was the mean weight required to break a non-varicose cord, but only 3000 grams for a varicose cord.

If the diagnosis of a short cord be made during the second stage of labor, it is generally advised to press the fundus of the uterus downward, thus endeavoring to bring the placental insertion nearer the fœtal. The use of forceps to deliver the delayed head may be required, but a resort to instrumental delivery in all cases of supposed brevity of the cord, a positive diagnosis prior to delivery of the head being impossible, is not indicated. In a case reported by Braxton Hicks[3] delay in the delivery of the second of twins being caused by absolute shortness of the cord—it was only four inches long—its division was made within the vagina: the child was, however, already dead. Burton in two cases of prolonged labor from brevity of the cord divided the latter with his finger-nails.

The retraction of the head immediately after a uterine pain, to which several authors have drawn attention as one of the symptoms of brevity of the cord, Pea[4] sought to prevent by pressure with the fingers in the rectum—an obstetric method with which most associate the name of Smellie. The statement of Peu is: "Introducing my fingers into the anus as far in front as possible, I used them at the return of pains to push the head and make it descend as low as I could, and to keep it there, thus preventing its ascending, as it previously had done."

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[1] In a case reported by Levret all of these accidents happened: the child was expelled while the mother was standing, and was killed by falling on the floor, but the full uterus and placenta were dragged out and the umbilical cord broken.

[2] *Centralb. für Gyn.*, 1885.

[3] *Transactions of the London Obstetrical Society*, vol. xxiii.

[4] *Op. cit.*

Smellie,[1] in his directions, "How to Behave when the Birth is Obstructed by the Navel-string of the Child or a Narrow Pelvis," observes: "When the head is therefore drawn back by any of these obstacles, and the delivery hath been retarded during several pains, one or two fingers, being introduced into the rectum before the pain goes off, ought to press upon the forehead of the child at the root of the nose, great care being taken to avoid the eyes: this pressure detains the head till the return of another pain, which will squeeze it farther down, while the fingers, pushing slowly and gradually, turn the forehead half round outward and half round upward. By this assistance and the help of strong pains the child will be forced along, although the neck be entangled in the navel-string; for as the child advances the uterus contracts, and consequently the placenta is moved lower; the funis umbilicalis will also stretch a little, without obstructing the circulation." In regard to the amount of stretching of the cord possible, it may be added that, according to Pfannkuch's experiments, this is half its original length.

In relative shortness from the cord being coiled about the neck, delay occurring after the birth of the head, we may endeavor to slip one or more coils over the head or extend them so that the shoulders can pass through, and thus at once relieve the tension of the cord and remove the peril of the child; if neither be possible—and of course such impossibility is present if there be material shortening of the cord—then the cord should be divided.

The umbilical cord is said to present when, the membranes being unruptured, it is felt along with the presenting part of the fœtus; but if after the rupture of the membranes it descends into the vagina, the condition is called prolapse, and distinguished as complete if the cord protrudes from the vagina. The distinction between presentation and prolapse of the cord is, so far as the terms are concerned, in some degree arbitrary; nevertheless, two different conditions exist, requiring different modes of treatment, and therefore the terms should be retained.

Prolapse of the cord is not infrequent, occurring once in about 225 labors. The causes are chiefly those which prevent the lower uterine segment from being completely occupied by the presenting part of the fœtus. Hence, this accident is not uncommon in case of a shoulder presentation or a flat pelvis; it is more frequent in presentation of the face or of the pelvis than in that of the cranium; it is not unusual in connection with prolapse of one of the members. It is observed oftener in multiparæ than in primiparæ; it is more liable to occur if the quantity of liquor amnii be great, especially if the amnial sac is ruptured while the woman is standing, or if the cord be abnormally long, or if the fœtus be very small. It is also facilitated by marginal attachment of the cord to the placenta, or by the latter being situated in the lower portion of the womb.

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[1] *Op. cit.* It is evident that the method, whether applied in this or other obstetric emergency, ought to be known as Peu's, and not Smellie's.

The DIAGNOSIS of presentation of the cord is usually difficult in the first part of dilatation of the os; but if the cord can be readily touched during an interval between uterine contractions, its characteristics will usually be recognized, for it has not the size, shape, or consistence of a prolapsed member, whether foot or hand, nor is it suddenly withdrawn, as one of these often is if touched: possibly by pressing it against a resisting part pulsation will be detected. The diagnosis of a prolapsed cord presents no great difficulty, and especially this prolapse cannot fail of ready recognition if pulsation is present. Presentation of the cord is not attended with any danger to the life of the child, for with unruptured membranes it cannot be pressed upon so as to interfere with the fœtal circulation; it is only a menace of prolapse which frequently brings such danger; nevertheless, it is probable that in most cases prolapse is averted by the descent of the head; for example, pressing away the cord and filling the space as it descends. But after the rupture of the amnial sac, should the cord descend in advance of the presenting part danger of compression between the latter and the walls of the birth-canal begins. The older obstetricians held that in complete prolapse danger came from that portion of the cord external to the vulva becoming cold, and hence coagulation of the blood resulted; indeed, Velpeau taught this, and even now Kormann states that in the presence of such a condition the cord should be enveloped with wet warm cloths and that it should be replaced in the vagina.

So long as there is merely presentation of the cord our chief object is to prevent its becoming a prolapse. Therefore every precaution must be taken to avoid premature rupture of the membranes: the woman should be recumbent, and preferably in such position that the part of the pelvis in which the cord presents shall be the highest, and thus if the cord be at the right side of the pelvis she will lie upon the left side of the body. If prolapse occurs, the presentation being that of the shoulder, podalic version is necessary in itself, so far as the interests of both mother and child are concerned, independently of the position occupied by the cord, and therefore the latter gives no special indication, except to reinforce the plan of treatment otherwise rendered essential. Presentation of the head gives the most dangerous prognosis in prolapsed cord, because the form and firmness of this part and the length of time required for its transmission render severe and continued compression of the cord more liable to occur. Nevertheless, even in this presentation, if the head be small, the pelvis roomy, and the labor-pains frequent and efficient, possibly assisted by a timely application of the forceps, delivery of a living child may often be accomplished. Meantime, the obstetrician in such a case carefully and frequently notes the condition of the cord as to pulsation, assisting his observations by auscultating the fœtal heart, and endeavors to place the cord in that position in the pelvis in which it will be least compressed. But in a case of vertex presentation, where no such prompt delivery can be reasonably expected, the cord must be placed above the presenting part or podalic version employed. The replacement of the funis does not present such great difficulty as the prevention of the recurrence of the prolapse; indeed, this recurrence is so common that some obstetricians have, in reference to repositing the cord, happily compared it to the task of the Danaïdes. The reposition of the cord may be manual, instrumental, or postural. Mauriceau directed that an effort be made to carry the cord by the fingers of one hand behind the head of the fœtus, and keep it there until the head had descended sufficiently to prevent it again prolapsing; he also added that a compress might be placed between the cord and head to prevent subsequent descent of the former. Other obstetricians have tried a sponge as a substitute for Mauriceau's compress. Success has been attained in some instances by hooking the cord over one of the fœtal members. Various repositors have been employed, some of them especially devised for the purpose, and others extemporaneous adaptations of bougie or of catheter. One of the oldest and best known means employed is making a bag into which a portion of the prolapsed cord is placed, and then the bag is attached to a piece of whalebone or a bougie, when the cord is thus carried above the head: as soon as the head descends the whalebone or bougie may be withdrawn. A repositor may be improvised of an ordinary firm rubber catheter and stylet with a piece of tape or cord. A loop of the tape is passed into the eye of the catheter, and the stylet then introduced, so that it holds the loop; the cord is fastened by the free ends of the tape, and then the catheter and cord carried into the uterus as far as necessary, when the stylet is withdrawn. Charpentier states that he has successfully employed the following method: The cord is encircled by a loop of silk and the ends tied, so that the former is held firmly, but not compressed; the ends of the silk are now fastened around the end of an olive-shaped or wax bougie; next the cord is thus carried in the uterine cavity so far that the lower end of the bougie is at the os. The bougie is left in the uterus, there is no tendency to recurrence of the prolapse, the instrument excites uterine contractions, and thus hastens the termination of the labor, which of course is always desirable.

Postural replacement of the cord by placing the woman in the knee-chest position was probably first proposed and employed by the famous Holland obstetrician, Deventer, and its advantages have in this country been especially made known by Thomas. Certainly in some cases the knee-chest position effectually remedies the displacement of the cord; but this result is more frequent if the cord simply presents than if it be actually prolapsed: moreover, the position must greatly hinder the progress of the labor if the woman occupies it during even a part of the second stage. In many instances where there are objections to the knee-chest position, as from the cause just mentioned, a lateral position may be employed, the woman of course lying upon the side opposite to that at which the prolapse occurs.

But the most important method of treating prolapse of the cord in a cephalic presentation, if a prompt delivery cannot be hoped for, is podalic version. Smellie said: "If the navel-string comes down by the side of the child's head and the pulsation is felt in the arteries, there is a necessity for turning without loss of time, for unless the head advances first and the delivery is quick the circulation in the vessels will be entirely obstructed and the child consequently perish. If the head is low in the pelvis, the forceps may be successfully used." McClintock, in a comment upon this passage, stated that of all the modes of treatment recommended, the most successful as regards the child is turning. "Thus of 64 cases in the practice of La Motte, Mauriceau, Lachapelle, Boivin, Giffard, and McClintock, when turning was resorted to solely on account of the funis presenting, 52 of the children were born alive." Of course if the child is dead prolapse of the cord does not offer any indication for interference.

Hemorrhage from the cord may result from its rupture in consequence of a velamentous insertion, the vessels being torn during the normal rupture of the membranes: this tearing necessarily occurs if these vessels occupy that portion of the fœtal sac nearest the os uteri. If this anomalous structure of the cord exist, and the blood-vessels occupy the position just mentioned, the diagnosis can be made during labor by recognizing the "pulsations of a vessel which may have the size of a crowquill," and precautionary measures may be tried to prevent early rupture of the membranes. Another diagnostic mark is hemorrhage at the time of the rupture of the membranes, the amnial fluid escaping, mixed with a large quantity of blood. If the vessels are torn and immediate delivery is impossible, the child perishes from anæmia. Even though rupture does not occur, the child's life may be endangered by asphyxia, for the vessels, instead of being torn, may be injuriously compressed.

Rupture of the cord from the child being born while the mother is standing, and falling to the floor, or even if she be delivered sitting and the cord is either relatively or absolutely short, is not usually followed by serious hemorrhage.

Coiling of the cord about the neck, body, or members of the fœtus is of significance in labor only as thereby shortening of the cord results, and hence dystocia; and as that topic has been considered, no further reference to such coils in the single fœtus will be referred to. But in case of twin pregnancy, the twins occupying a common amnial sac, the cord of one child may embrace some part of the other. Kormann states that hitherto only 12 cases of this accident have been observed: death of one or of both children may result.

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